AN ACCIDENT PREVENTION SYSTEM AND A VEHICLE INCLUDING THE ACCIDENT PREVENTION SYSTEM

FIELD OF THE INVENTION

This invention relates to an accident prevention system for use on vehicles and to a vehicle including the accident prevention system. This invention also relates to a method of preventing an accident when a vehicle collides with an object.

This invention relates particularly but not exclusively to an accident prevention system for preventing a small child or animal being run over by a motor vehicle that is reversing at low speed on a travel surface such as a driveway. It will therefore be convenient to hereinafter describe the invention with reference to this example application. However at the same time it is to be clearly understood that the invention is capable of broader application. For example the invention extends to all forms of vehicles and not just motor vehicles. It also extends to a system for preventing reversing accidents with inanimate objects such as posts and walls. It is not limited to a system for preventing reversing accidents involving small children.

DEFINITIONS

In this specification the term 'reversing accident' will be used to describe and define a motor vehicle accident that occurs when a vehicle travelling at low speed in reverse gear collides with an object or a person or an animal. It includes a vehicle accident in a driveway involving a small child but is not limited to this class of accidents.

In this specification the term 'accident prevention' shall be understood to mean a system that is useful in helping to prevent accidents. However it is to be clearly understood that it does not mean that it is capable of preventing all accidents from occurring. In reality it helps to avoid accidents or resists accidents but does not eliminate the chance of an accident completely.

In this specification the term 'mammal' shall be understood to mean any warm blooded creature that meets the scientific definition of a land mammal but excluding mammals that live in water. ~~It shall be interpreted to include human beings but shall not be limited to human beings. It shall also include dogs and cats.~~

In this specification the term 'heat sensor' shall be interpreted to mean a passive IR sensor that can sense IR radiation or heat generated by a mammal such as a human

CLAIMS:

1. An accident prevention system for use on a vehicle having a front end and a rear end, the accident prevention system including:

a sensor arrangement for mounting on the vehicle for sensing an object rearward of the rear end of the vehicle, and that generates an object recognition signal when it senses an object satisfying a certain condition;

a controller that is operatively coupled to the sensor arrangement and that generates an accident prevention response signal on receiving an object recognition signal from the sensor arrangement; and

a brake applicator that is operatively coupled to a brake of the vehicle in use, the brake applicator is operatively connected to the controller and applies the brake of the vehicle when the controller generates a said accident prevention response signal whereby to resist movement of the vehicle.

2. An accident prevention system for use on a vehicle according to claim 1, wherein the sensor arrangement includes an IR sensor arrangement that senses IR heat and that generates an object recognition signal, when it senses an object satisfying the condition that it radiates IR heat corresponding to a mammal, and sends it to the controller.

3. An accident prevention system for use on a vehicle according to claim 2, wherein the IR sensor arrangement comprises at least one IR sensor that is mounted on the rear end of the vehicle, or wherein the IR sensor arrangement comprises a plurality of IR sensors that are spaced apart across the rear end of the vehicle.

4. An accident prevention system for use on a vehicle according to claim 1, wherein the sensor arrangement includes a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses return pulses returning to the sensor arrangement, and the sensor arrangement generates an object recognition signal, when it senses an object satisfying the condition that it is within a certain range of the rear end of the vehicle, and sends the object recognition signal to the controller.

5. An accident prevention system for use on a vehicle according to claim 4, wherein the reflected pulse sensor arrangement generates an object recognition signal

when it identifies objects within a range that is a distance of less than 2.0m of the rear end of the vehicle.

6. An accident prevention system for use on a vehicle according to claim 5, wherein the reflected pulse sensor arrangement comprises one or more reflected pulse sensors that are positioned on the rear end of the vehicle.

7. An accident prevention system for use on a vehicle according to claim 6, wherein the one or more reflected pulse sensors comprises sonar sensors that pulse sound waves and sense when the sound waves return to the sensor arrangement.

8. An accident prevention system for use on a vehicle according to claim 7, wherein the reflected pulse sensor arrangement comprises a radar sensor arrangement that pulses radio waves and senses when they return to the sensor arrangement.

9. An accident prevention system for use on a vehicle according to claim 7, wherein the reflected pulse sensor arrangement comprises a microwave sensor arrangement that pulses microwaves and senses when they return to the sensor arrangement.

10. An accident prevention system for use on a vehicle according to claim 1, wherein the sensor arrangement includes:

an IR sensor arrangement that senses IR heat and that generates an object recognition signal when it senses an object when it senses an object satisfying the condition that it radiates IR heat corresponding to a mammal, and sends it to the controller; and

a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses return pulses returning to the sensor arrangement, and the sensor arrangement generates an object recognition signal, when it senses an object satisfying the condition that it is within a certain range of the rear end of the vehicle, and sends the object recognition signal to the controller.

11. An accident prevention system for use on a vehicle according to claim 10, wherein the IR sensor arrangement comprises one or more passive IR sensors and the reflected pulse sonar arrangement comprises a plurality of sonar sensors.

12. An accident prevention system for use on a vehicle according to any one of claims 1 to 11, wherein the brake applicator includes a solenoid that is operatively

connected to the controller, a brake mounting member and a cable operatively coupling the brake mounting member to the solenoid.

13. An accident prevention system for use on a vehicle according to any one of claims 1 to 12, further including an alarm that is operatively connected to the controller, and wherein the alarm issues an alarm signal on receiving an accident prevention response signal from the controller.

14. An accident prevention system for use on a vehicle according to claim 13, wherein the alarm includes a siren that issues an audio alarm signal and the alarm further includes a visual alarm in the form of a flashing light that is visible to persons outside of the vehicle.

15. An accident prevention system for use on a vehicle according to claim 14, wherein the controller is a central processing unit contained within a control housing, and wherein the CPU is wired to the sensor arrangement and the CPU is wired to the brake applicator and to the alarm.

16. An accident prevention system for use on a vehicle according to claim 1, wherein the brake applicator is operatively mounted on the operating foot brake of the vehicle that is used when the vehicle is driven on the road.

17. An accident prevention system for use on a vehicle having a front end and a rear end, the accident prevention system including:

a sensor arrangement for mounting on a motor vehicle for sensing an object rearward of the rear end of the vehicle, and that generates an object recognition signal when it senses an object satisfying a certain condition; and

a controller that is operatively coupled to the sensor arrangement and that generates an accident prevention response signal on receiving an object recognition signal from the sensor arrangement.

18. An accident prevention system for use on a vehicle according to claim 17, wherein the sensor arrangement includes an IR sensor arrangement that senses IR heat and that generates an object recognition signal, when it senses an object satisfying the condition that it radiates IR heat corresponding to a mammal, and sends it to the controller.

19. An accident prevention system for use on a vehicle according to claim 18, wherein the sensor arrangement includes a reflected pulse sensor arrangement that

transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses return pulses returning to the sensor arrangement, and the sensor arrangement generates an object recognition signal when it senses an object satisfying the condition that it is within a certain range of the rear end of the vehicle, and sends the object recognition signal to the controller.

20. An accident prevention system for use on a vehicle according to claim 19, wherein the reflected pulse sensor arrangement is a sonar pulse sensor arrangement, a radar pulse sensor arrangement or a microwave pulse sensor arrangement.

21. A vehicle having an accident prevention system installed thereon, including:

a vehicle body having a front end and a rear end mounted on ground engaging formations that permit the vehicle body to travel across a surface, the vehicle including at least one brake for stopping the vehicle;

a sensor arrangement mounted on the vehicle for sensing an object rearward of the rear end of the vehicle, and that generates an object recognition signal when it senses an object satisfying a certain condition;

a controller that is operatively coupled to the sensor arrangement and that generates an accident prevention response signal on receiving an object recognition signal from the sensor arrangement; and

a brake applicator that is operatively coupled to a said brake, the brake applicator is operatively connected to the controller and applies the brake when the controller generates a said accident prevention response signal whereby to resist movement of the vehicle.

22. A vehicle having an accident prevention system installed thereon according to claim 21, wherein the sensor arrangement includes an IR sensor arrangement that senses IR heat and that generates an object recognition signal when it senses an object satisfying the condition that it radiates IR heat corresponding to a mammal, and sends it to the controller.

23. A vehicle having an accident prevention system installed thereon according to claim 22, wherein the IR sensor arrangement comprises at least one IR sensor that is mounted on the rear end of the vehicle.

24. A vehicle having an accident prevention system installed thereon according to claim 21, wherein the sensor arrangement includes a reflected pulse sensor

arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses return pulses returning to the sensor arrangement, and the sensor arrangement generates an object recognition signal when it senses an object satisfying the condition that it is within a certain range of the rear end of the vehicle, and sends the object recognition signal to the controller.

25. A vehicle having an accident prevention system installed thereon according to claim 24, wherein the reflected pulse sensor arrangement generates an object recognition signal when it identifies objects within a range that is a distance of less than 2.0 m from the rear end of the vehicle.

26. A vehicle having an accident prevention system installed thereon according to claim 24 or claim 25, wherein the reflected pulse sensor arrangement comprises one or more reflected pulse sensors that are positioned on the rear end of the vehicle.

27. A vehicle having an accident prevention system installed thereon according to claim 26, wherein the one or more reflected pulse sensors comprises sonar sensors that pulse sound waves and sense when the sound waves return to the sensor arrangement.

28. A vehicle having an accident prevention system installed thereon according to claim 26, wherein the reflected pulse sensor arrangement comprises a radar sensor arrangement that pulses radio waves and senses when they return to the sensor arrangement.

29. A vehicle having an accident prevention system installed thereon according to claim 26, wherein the reflected pulse sensor arrangement comprises a microwave sensor arrangement that pulses microwaves and senses when they return to the sensor arrangement.

30. A vehicle having an accident prevention system installed thereon according to claim 21, wherein the sensor arrangement includes:

an IR sensor arrangement that senses IR heat and that generates an object recognition signal when it senses an object radiating IR heat corresponding to a mammal and sends it to the controller; and

a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses return

pulses returning to the sensor arrangement, and the sensor arrangement generates an object recognition signal when it senses an object within a certain range of the rear end of the vehicle and sends the object recognition signal to the controller.

31. A vehicle having an accident prevention system installed thereon according to claim 30, wherein the IR sensor arrangement comprises one or more passive IR sensors and the reflected pulse sonar arrangement comprises a plurality of sonar sensors.

32. A vehicle having an accident prevention system installed thereon according to any one of claims 21 to 31, wherein the brake applicator includes a solenoid that is operatively connected to the controller, a brake mounting member and a cable operatively coupling the brake mounting member to the solenoid.

33. A vehicle having an accident prevention system installed thereon according to claim 32, wherein the solenoid comprises a solenoid housing having at least electrical coil and a plunger received within the housing, wherein the accident prevention response signal from the controller energises the electrical coil/s and displaces the plunger within the solenoid housing which in turn through the cable displaces the brake mounting member by a corresponding distance and thereby apply the brake, and including **a** mechanical arrangement that enables the solenoid plunger to be displaced into contact with a holding coil switch whilst being attached to said cable, whereby to enable the cable to extend fully into contact with the holding coil switch when its movement is otherwise restricted.

34. A vehicle having an accident prevention system installed thereon according to any one of claims 21 to 33, further including an alarm that is operatively connected to the controller, and wherein the alarm issues an alarm signal on receiving an accident prevention response signal from the controller.

35. A vehicle having an accident prevention system installed thereon according to claim 34, wherein the vehicle body includes a cabin within which a driver's seat is located, and the alarm includes a siren mounted on the vehicle outside of the cabin that issues an audio alarm signal, and further includes a visual alarm mounted on the vehicle inside the cabin in the form of a flashing light that is visible to persons outside of the vehicle.

36. A vehicle having an accident prevention system installed thereon according to claim 34, wherein the vehicle is a production motor vehicle with its own engine that can be driven on public roads, and wherein the brake is the foot brake on the vehicle that is used to stop the vehicle when it is travelling on the road.

37. A vehicle having an accident prevention system installed thereon, including:

a vehicle body having a front end and a rear end mounted on ground engaging formations that permit the vehicle body to travel across a surface, the vehicle including at least one brake for stopping the vehicle;

a sensor arrangement mounted on the vehicle for sensing an object rearward of the rear end of the vehicle, and that generates an object recognition signal when it senses an object satisfying a certain condition; and

a controller that is operatively coupled to the sensor arrangement and that generates an accident prevention response signal on receiving an object recognition signal from the sensor arrangement.

38. A method for preventing a reversing accident where a vehicle that is reversing a low speed collides with a person in its path of travel, the method including:

sensing an object rearward of a rear end of the vehicle and generating an object recognition signal when an object is sensed that meets a certain condition; and

generating an accident prevention response signal on receiving an object recognition signal from the sensor arrangement, the accident prevention response signal response includes applying the brakes of the vehicle to either bring it to a halt if it is reversing or to stop it from reversing if it is stationary.

39. A method for preventing a reversing accident according to claim 38, wherein sensing an object rearward of a rear end of the vehicle includes sensing IR heat from a mammal using a passive IR sensor.

40. A method for preventing a reversing accident according to claim 38, wherein sensing an object rearward of a rear end of the vehicle includes transmitting a pulse of electromagnetic radiation away from the rear end of the vehicle and sensing for return pulses that return to the sensor arrangement.

41. A method for preventing a reversing accident according to claim 38, wherein transmitting a pulse of electromagnetic radiation away from the rear end of the

vehicle may comprise transmitting a sonar pulse, a radar pulse or a microwave pulse.

42. A method for preventing a reversing accident according to any one of claims 38 to 41, wherein said generating an accident prevention response signal includes issuing an alarm.

43. A method for preventing a reversing accident according to claim 42, wherein said issuing an alarm comprises issuing an audio alarm outside of the vehicle or an audio alarm inside of the vehicle.

AMENDED CLAIMS:

1. An accident prevention system for use on a vehicle having a front end and a rear end, the accident prevention system including:

a sensor arrangement for mounting on the vehicle for sensing an object rearward of the rear end of the vehicle, and that generates an object recognition signal when an object satisfying a certain condition is sensed;

a controller that is operatively coupled to the sensor arrangement and that generates an accident prevention response signal on receiving an object recognition signal from the sensor arrangement; and

a brake applicator for operative coupling to an operating foot brake of the vehicle and the brake applicator is operatively connected to the controller;

whereby, in use, the brake applicator applies the foot brake of the vehicle when the controller generates a said accident prevention response signal to thereby resist movement of the vehicle.

2. An accident prevention system for use on a vehicle according to claim 1, wherein the sensor arrangement includes an IR sensor arrangement that senses IR heat and that generates an object recognition signal when it identifies an object satisfying the condition that it radiates IR heat corresponding to a mammal and sends the object recognition signal to the controller.

3. An accident prevention system for use on a vehicle according to claim 2, wherein the IR sensor arrangement comprises at least one IR sensor that is mounted on the rear end of the vehicle, or wherein the IR sensor arrangement comprises a plurality of IR sensors that are spaced apart across the rear end of the vehicle.

4. An accident prevention system for use on a vehicle according to claim 1, wherein the sensor arrangement includes a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from

the rear end of the vehicle and senses reflected pulses returning to the sensor arrangement, and the sensor arrangement generates an object recognition signal when it senses an object within a certain range of the rear end of the vehicle and sends the object recognition signal to the controller.

5. An accident prevention system for use on a vehicle according to claim 4, wherein the reflected pulse sensor arrangement generates an object recognition signal when it senses objects within a range of 2.0 m of the rear end of the vehicle.

6. An accident prevention system for use on a vehicle according to claim 5, wherein the reflected pulse sensor arrangement comprises one or more reflected pulse sensors for positioning on the rear end of the vehicle.

7. An accident prevention system for use on a vehicle according to claim 6, wherein the one or more reflected pulse sensors comprises sonar sensors that pulse sound waves and sense when reflected sound waves return to the sensor arrangement.

8. An accident prevention system for use on a vehicle according to claim 7, wherein the reflected pulse sensor arrangement comprises a radar sensor arrangement that pulses radio waves and senses when reflected radio waves return to the sensor arrangement.

9. An accident prevention system for use on a vehicle according to claim 7, wherein the reflected pulse sensor arrangement comprises a microwave sensor arrangement that pulses microwaves and senses when reflected microwaves return to the sensor arrangement.

10. An accident prevention system for use on a vehicle according to claim 1, wherein the sensor arrangement includes:

an IR sensor arrangement that senses IR heat and that generates a mammal recognition signal when it identifies an object satisfying the

condition that it radiates IR heat corresponding to a mammal, and sends the mammal recognition signal to the controller; and

a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses reflected pulses returning to the sensor arrangement, and the sensor arrangement generates an object sensing signal when it senses an object satisfying the condition that it is within a certain range of the rear end of the vehicle and sends the object sensing signal to the controller.

11. An accident prevention system for use on a vehicle according to claim 10, wherein the IR sensor arrangement comprises one or more passive IR sensors and the reflected pulse sonar arrangement comprises a plurality of sonar sensors.

12. An accident prevention system for use on a vehicle according to any one of claims 1 to 11, wherein the brake applicator includes a solenoid that is operatively connected to the controller, a brake mounting member for fixing to the foot brake and a cable operatively coupling the brake mounting member to the solenoid.

13. An accident prevention system for use on a vehicle according to any one of claims 1 to 12, further including an alarm that is operatively connected to the controller, and wherein the alarm issues an alarm signal on receiving an accident prevention response signal from the controller.

14. An accident prevention system for use on a vehicle according to claim 13, wherein the alarm includes a siren that issues an audio alarm signal and the alarm further includes a visual alarm in the form of a flashing light that is visible to persons outside of the vehicle.

15. An accident prevention system for use on a vehicle according to either claim 13 or claim 14, wherein the controller includes a processor , wherein the processor has inputs wired to the sensor arrangement and the processor has outputs wired to the brake applicator and to the alarm.

16. An accident prevention system for use on a vehicle having a front end and a rear end, the accident prevention system including:

a sensor arrangement for mounting on a motor vehicle for sensing an object rearward of the rear end of the vehicle, and that generates an object recognition signal when an object satisfying a certain condition is sensed; the sensor arrangement including:

an IR sensor arrangement that senses IR heat and generates the object recognition signal upon identifying an object radiating IR heat corresponding to a mammal, and

a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses return pulses and generates the object recognition signal when it senses an object within a certain range of the rear end of the vehicle; and

a controller that is operatively coupled to the sensor arrangement and that generates an accident prevention response signal on receiving an object recognition signal from the sensor arrangement.

17. An accident prevention system for use on a vehicle according to claim 16, wherein the reflected pulse sensor arrangement is a sonar pulse sensor arrangement, a radar pulse sensor arrangement, or a microwave pulse sensor arrangement.

18. A vehicle having an accident prevention system installed thereon, including:

a vehicle body having a front end and a rear end mounted on ground engaging formations that permit the vehicle body to travel across a surface, the vehicle including at least one brake for stopping the vehicle;

a sensor arrangement mounted on the vehicle for sensing an object rearward of the rear end of the vehicle, and that generates an object recognition signal when an object satisfying a certain condition is sensed;

a controller that is operatively coupled to the sensor arrangement and that generates an accident prevention response signal on receiving an object recognition signal from the sensor arrangement; and

a brake applicator that is operatively coupled to a brake pedal of said brake, the brake applicator is operatively connected to the controller and applies the at least one brake by operating the brake pedal when the controller generates a said accident prevention response signal to thereby resist movement of the vehicle.

19. A vehicle having an accident prevention system installed thereon according to claim 18, wherein the sensor arrangement includes an IR sensor arrangement that senses IR heat and that generates an object recognition signal when it identifies an object radiating IR heat corresponding to a mammal and sends the object recognition signal to the controller.

20. A vehicle having an accident prevention system installed thereon according to claim 19, wherein the IR sensor arrangement comprises at least one IR sensor that is mounted on the rear end of the vehicle.

21. A vehicle having an accident prevention system installed thereon according to claim 18, wherein the sensor arrangement includes a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses return pulses returning to the sensor arrangement, and the sensor arrangement generates an object recognition signal when it senses an object within a certain range of the rear end of the vehicle and sends the object recognition signal to the controller.

22. A vehicle having an accident prevention system installed thereon according to claim 21, wherein the reflected pulse sensor arrangement generates an object recognition signal when it senses an object within a range of 2.0 m of the rear end of the vehicle.

23. A vehicle having an accident prevention system installed thereon according to either claim 21 or claim 22, wherein the reflected pulse sensor

arrangement comprises one or more reflected pulse sensors that are positioned on the rear end of the vehicle.

24. A vehicle having an accident prevention system installed thereon according to claim 23, wherein the one or more reflected pulse sensors comprises sonar sensors that pulse sound waves and sense when reflected sound waves return to the sensor arrangement.

25. A vehicle having an accident prevention system installed thereon according to claim 23, wherein the reflected pulse sensor arrangement comprises a radar sensor arrangement that pulses radio waves and senses when reflected radio waves return to the sensor arrangement.

26. A vehicle having an accident prevention system installed thereon according to claim 23, wherein the reflected pulse sensor arrangement comprises a microwave sensor arrangement that pulses microwaves and senses when reflected microwaves return to the sensor arrangement.

27. A vehicle having an accident prevention system installed thereon according to claim 18, wherein the sensor arrangement includes:

an IR sensor arrangement that senses IR heat and that generates amammal recognition signal when it identifies an object radiating IR heat corresponding to a mammal and sends the mammal recognition signal to the controller; and

a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses reflected pulses returning to the sensor arrangement, and the sensor arrangement generates an object sensing signal when it senses an object within a certain range of the rear end of the vehicle and sends the object sensing signal to the controller.

28. A vehicle having an accident prevention system installed thereon according to claim 27, wherein the IR sensor arrangement comprises one or more

passive IR sensors and the reflected pulse sonar arrangement comprises a plurality of sonar sensors.

29. A vehicle having an accident prevention system installed thereon according to any one of claims 18 to 29, wherein the brake applicator includes a solenoid that is operatively connected to the controller, a brake mounting member fixed to the brake pedal and a cable operatively coupling the brake mounting member to the solenoid.

30. A vehicle having an accident prevention system installed thereon according to claim 29, wherein the solenoid comprises a solenoid housing having at least one electrical coil and a plunger received within the housing, wherein the accident prevention response signal from the controller energises said at least one electrical coil and displaces the plunger within the solenoid housing which in turn through the cable displaces the brake mounting member to thereby apply the brake; and

wherein the brake applicator includes a mechanical arrangement that enables the solenoid plunger to be displaced into contact with a holding coil switch whilst being attached to said cable, thereby enabling the cable to extend fully into contact with the holding coil switch when its movement is otherwise restricted.

31. A vehicle having an accident prevention system installed thereon according to any one of claims 18 to 30, further including an alarm that is operatively connected to the controller, and wherein the alarm issues an alarm signal on receiving an accident prevention response signal from the controller.

32. A vehicle having an accident prevention system installed thereon according to claim 31, wherein the vehicle body includes a cabin within which a driver's seat is located, and the alarm includes a siren mounted on the vehicle outside of the cabin that issues an audio alarm signal, and further includes a visual alarm mounted on the vehicle inside the cabin in the form of a flashing light that is visible to persons outside of the vehicle.

33. A vehicle having an accident prevention system installed thereon according to claim 31, wherein the vehicle is a production motor vehicle able to be driven on public roads.

34. A vehicle having an accident prevention system installed thereon, the vehicle including:

a vehicle body having a front end and a rear end mounted on ground engaging formations that permit the vehicle body to travel across a surface, the vehicle including at least one brake for stopping the vehicle;

a sensor arrangement mounted on the vehicle for sensing an object rearward of the rear end of the vehicle, and that generates an object recognition signal when an object satisfying certain conditions is sensed, the sensor arrangement further including:

an IR sensor arrangement that senses IR heat and generates the object recognition signal upon identifying an object radiating IR heat corresponding to a mammal, and

a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses return pulses and generates the object recognition signal when it senses an object within a certain range of the rear end of the vehicle; and

a controller that is operatively coupled to the sensor arrangement and that generates an accident prevention response signal on receiving an object recognition signal from the sensor arrangement.

35. A method for preventing a reversing accident involving a vehicle including at least one brake for stopping the vehicle, the method including:

sensing an object rearward of a rear end of the vehicle and generating an object recognition signal when an object that meets certain conditions is sensed, wherein the sensing step includes the further steps of:

sensing IR heat of an object to identify a mammal using a passive IR sensor, and/or

transmitting a pulse of electromagnetic radiation away from the rear end of the vehicle and sensing for reflected pulses that return to the sensor arrangement;

generating an accident prevention response signal on receiving an object recognition signal from the sensor arrangement ; and

applying, in response to the accident prevention signal, the at least one brake of the vehicle to either bring it to a halt if it is reversing or to stop it from reversing if it is stationary.

36. A method for preventing a reversing accident according to claim 35, wherein transmitting a pulse of electromagnetic radiation away from the rear end of the vehicle may comprise transmitting a sonar pulse, a radar pulse or a microwave pulse.

37. A method for preventing a reversing accident according to either claim 35 or claim 36, wherein said generating an accident prevention response signal includes issuing an alarm.

38. A method for preventing a reversing accident according to claim 37, wherein said issuing an alarm comprises issuing an audio alarm outside of the vehicle and/or a visual alarm inside of the vehicle.

39. A method for preventing a reversing accident according to any one of claims 35 to 38 wherein the applying step includes provision of a brake applicator coupled to a brake pedal, which brake applicator is controlled independently of the vehicle driver and in response to the accident response signal.

Claims

The invention claimed is:

1. A method for preventing a reversing accident where a vehicle that is reversing a low speed collides with a person in the path of travel of the vehicle, the method comprising:

sensing an object in the path of travel by means of a sensor arrangement that generates an object recognition signal when the sensor arrangement senses an object satisfying a predetermined condition;

wherein the sensor arrangement comprises an IR sensor arrangement and a reflected pulse sensor arrangement that are mounted on the rear end of the vehicle, and sensing an object comprises:

passive sensing of IR heat from a mammal with said IR sensor and generating an object recognition signal when it senses an object satisfying the condition that it radiates IR heat corresponding to a mammal, and

transmitting pulses of electromagnetic radiation away from the rear end of the vehicle and sensing return pulses returning to the sensor arrangement, and generating an object recognition signal comprises sensing when an object is within a predetermined range of the rear end of the vehicle;

sending the object recognition signal to a controller that is operatively coupled to the sensor arrangement; and

sending an accident prevention response signal from the controller to a brake applicator on receiving the object recognition signal which then applies the brake of the vehicle whereby to resist movement of the vehicle.

2. A method for preventing a reversing accident according to claim 1, wherein the sensor arrangement comprises at least one IR sensor on a rear end of the vehicle, and sensing an object comprises passive sensing of IR heat from a mammal with said IR sensor and generating an object recognition signal when it senses an object satisfying the condition that it radiates IR heat corresponding to a mammal.

3. The method for preventing a reversing accident according to claim 1, wherein the sensor arrangement comprises a reflected pulse sensor arrangement on a rear end of the vehicle, and sensing an object comprises transmitting pulses of electromagnetic

radiation away from the rear end, and sensing return pulses returning to the sensor arrangement, and generating an object recognition signal comprises sensing when an object is within a predetermined range of the rear end of the vehicle.

4. The method for preventing a reversing accident according to claim 1, wherein sensing an object comprises sensing when an object is within a predetermined range of between 0.5 meters and 2.0 meters of the rear end of the vehicle.

5. The method for preventing a reversing accident according to claim 1, herein transmitting pulses of electromagnetic radiation away from the rear end of the vehicle comprises transmitting pulses of sound waves or radio waves or microwaves away from the rear end of the vehicle.

6. The method for preventing a reversing accident according to claim 1, which also includes sending each accident prevention response signal to an alarm which then issues an alarm signal.

7. The method for preventing a reversing accident according to claim 1, wherein issuing an alarm signal comprises issuing an audio alarm and a visual alarm.

8. The method for preventing a reversing accident according to claim 1, wherein applying the brake of the vehicle comprises passing en electric current through a solenoid to displace a cable which is operatively connected to a brake pedal of a foot brake whereby to displace the brake pedal downward to apply the foot brake.

9. A method for preventing a reversing accident where a vehicle that is reversing a low speed collides with a person in the vehicle's path of travel, the method comprising:

sensing an object rearward of a rear end of the vehicle by means of a sensor arrangement that generates an object recognition signal when an object is sensed that meets a predetermined condition;

wherein the sensor arrangement comprises an IR sensor arrangement and a reflected pulse sensor arrangement that are mounted on the rear end of the vehicle, and sensing an object comprises:

passive sensing of IR heat from a mammal with said IR sensor and generating an object recognition signal when it senses an object satisfying the condition that it radiates IR heat corresponding to a mammal, and

transmitting pulses of electromagnetic radiation away from the rear end of the vehicle and sensing return pulses returning to the sensor arrangement, and generating an object recognition signal comprises sensing when an object is within a predetermined range of the rear end of the vehicle;

generating an accident prevention response signal on receiving the object recognition signal from the sensor arrangement, the accident prevention response signal response comprises applying the brakes of the vehicle to either bring the vehicle to a halt if it is reversing or to stop the vehicle from reversing if the vehicle is stationary.

10. The method for preventing a reversing accident according to claim 9, wherein sensing an object rearward of a rear end of the vehicle comprises sensing IR heat from a mammal using a passive IR sensor or sensing an object comprises transmitting a pulse of electromagnetic radiation away from the rear end of the vehicle and sensing for return pulses that return to the sensor arrangement.

11. The method for preventing a reversing accident according to claim 9, wherein the generating an accident prevention response signal comprises issuing an alarm.

12. An accident prevention system for use on a vehicle comprising a front end and a rear end, the accident prevention system comprising:

a sensor arrangement for mounting on the vehicle for sensing an object rearward of the rear end of the vehicle, and that generates an object recognition signal when the sensor arrangement senses an object satisfying a predetermined condition;

a controller that is operatively coupled to the sensor arrangement and that generates an accident prevention response signal on receiving an object recognition signal from the sensor arrangement;

wherein the sensor arrangement comprises a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses return pulses returning to the sensor arrangement, and the sensor arrangement generates an object recognition signal, when the sensor arrangement senses an object satisfying the condition that the object is within a predetermined range of the rear end of the vehicle, and sends the object recognition signal to the controller; and

a brake applicator that is operatively coupled to a brake of the vehicle in use, the brake applicator is operatively connected to the controller and applies the brake of the vehicle when the controller generates the accident prevention response signal whereby to resist movement of the vehicle.

13. The accident prevention system for use on a vehicle according to claim 12, wherein the sensor arrangement that comprises at least one IR sensor that is mounted on the rear end of the vehicle that senses heat and generates an object recognition signal when it senses an object satisfying the condition that it radiates IR heat corresponding to a mammal.

14. The accident prevention system for use on a vehicle according to claim 12, wherein the IR sensor arrangement comprises a plurality of IR sensors that are spaced apart across the rear end of the vehicle.

15. The accident prevention system for use on a vehicle according to claim 13, wherein the reflected pulse sensor arrangement generates an object recognition signal when the reflected pulse sensor arrangement identifies objects within a range that is a distance of between 0.5 meters and 2.0 meters of the rear end of the vehicle.

16. The accident prevention system for use on a vehicle according to claim 15, wherein the reflected pulse sensor arrangement comprises one or more reflected pulse sensors positioned on the rear end of the vehicle.

17. The accident prevention system for use on a vehicle according to claim 12, wherein the sensor arrangement comprises:

an IR sensor arrangement that senses IR heat and that generates an object recognition signal when the IR sensor arrangement senses an object satisfying the condition that it radiates IR heat corresponding to a mammal, and sends it to the controller; and

a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses return pulses returning to the sensor arrangement, and the sensor arrangement generates an object recognition signal, when it senses an object satisfying the condition that it is within a predetermined range of the rear end of the vehicle, and sends the object recognition signal to the controller.

18. The accident prevention system for use on a vehicle according to claim 17, wherein the IR sensor arrangement comprises one or more passive IR sensors and the reflected pulse sonar arrangement comprises a plurality of sonar sensors.

19. The accident prevention system for use on a vehicle according to claim 12, wherein the brake applicator comprises a solenoid that is operatively connected to the controller, a brake mounting member for operatively mounting to a foot brake of the vehicle in use, and a cable operatively coupling the brake mounting member to the solenoid.

20. The accident prevention system for use on a vehicle according to claim 12, further comprising an alarm that is operatively connected to the controller, and wherein the alarm issues an alarm signal on receiving an accident prevention response signal from the controller.

21. The accident prevention system for use on a vehicle according to claim 20, wherein the controller is a central processing unit contained within a control housing, and wherein the CPU is wired to the sensor arrangement and the CPU is wired to the brake applicator and to the alarm.

22. A vehicle comprising an accident prevention system installed thereon, comprising:

a vehicle body comprising a front end and a rear end mounted on ground engaging formations that permit the vehicle body to travel across a surface, the vehicle comprising at least one brake for stopping the vehicle;

a sensor arrangement mounted on the vehicle for sensing an object rearward of the rear end of the vehicle, and that generates an object recognition signal when the sensor arrangement senses an object satisfying a predetermined condition;

a controller that is operatively coupled to the sensor arrangement and that generates an accident prevention response signal on receiving an object recognition signal from the sensor arrangement;

wherein the sensor arrangement comprises an IR sensor arrangement that senses IR heat and that generates an object recognition signal when IR sensor arrangement senses an object radiating IR heat corresponding to a mammal and sends the object recognition signal to the controller; and

a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses return pulses returning to the sensor arrangement, and the sensor arrangement generates an object recognition signal when the sensor arrangement senses an object within a predetermined range of the rear end of the vehicle and sends the object recognition signal to the controller; and

a brake applicator that is operatively coupled to a brake, and the brake applicator is operatively connected to the controller and applies the brake when the controller generates the accident prevention response signal whereby to resist movement of the vehicle.

23. A vehicle comprising an accident prevention system installed thereon according to claim 22, wherein the sensor arrangement comprises an IR sensor arrangement that senses IR heat and that generates an object recognition signal when it senses an object satisfying the condition that it radiates IR heat corresponding to a mammal, and sends it to the controller.

24. A vehicle comprising an accident prevention system installed thereon according to claim 22, wherein the sensor arrangement comprises a reflected pulse sensor arrangement that transmits pulses of electromagnetic radiation away from the rear end of the vehicle and senses return pulses returning to the sensor arrangement, and the sensor arrangement generates an object recognition signal when the sensor arrangement senses an object satisfying the condition that the object is within a predetermined range of the rear end of the vehicle, and sends the object recognition signal to the controller.

25. A vehicle comprising an accident prevention system installed thereon according to claim 24, wherein the reflected pulse sensor arrangement comprises one or more reflected pulse sensors that are positioned on the rear end of the vehicle, and wherein the reflected pulse sensor arrangement generates an object recognition signal when the reflected pulse sensor arrangement identifies objects within a range that is a distance of between 0.5 meters and 2.0 meters from the rear end of the vehicle.

26. A vehicle comprising an accident prevention system installed thereon according to claim 25, wherein the one or more reflected pulse sensors comprises sonar sensors that pulse sound waves, or radar sensors that pulse radio waves, or microwave

sensors that pulse microwaves, and the sensors sense when the reflected waves return to the sensor arrangement.

27. A vehicle comprising an accident prevention system installed thereon according to claim 22, further comprising an alarm that is operatively connected to the controller, and wherein the alarm issues an alarm signal on receiving an accident prevention response signal from the controller.

28. Software for preventing a reversing accident, the software embodied on at least one non-transitory computer readable medium and operable when executed by at least one processor to perform the method according to claim 1.

29. Software for preventing a reversing accident, the software embodied on at least one non-transitory computer readable medium and operable when executed by at least one processor to perform the method according to claim 9.