(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 666 945 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.11.2013 Bulletin 2013/48

(51) Int Cl.:
E05F 5/00 *(2006.01)* ***E05F 15/00*** *(2006.01)*

(21) Application number: **12169412.9**

(22) Date of filing: **25.05.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **Volvo Car Corporation**
40 531 Göteborg (SE)

(72) Inventors:
- **Downs, John**
  Simi Valley, CA 93065 (US)
- **Wessman, Björn**
  423 41 Göteborg (SE)
- **Frasher, Douglas**
  Newbury Park, CA 91320 (US)
- **Kesich, Stephen**
  Rancho Murieta, CA 95683 (US)

(74) Representative: **Widahl, Jenny Marie**
Volvo Car Corporation
50094 Intellectual Property
VAK-HBBVN
40531 Göteborg (SE)

(54) A door stop system

(57) A vehicle door stop system for preventing the door (1) being damaged opening it into an object and/or preventing the object being damaged comprises a control unit, a detecting device and a braking device. The detecting device is arranged in the rear side view mirror (2). A method for preventing a door (1, 3) of a vehicle hitting an object or a moving object hitting the door when opening of the door comprises monitoring the swing path space of a door with a sensor arranged on the vehicle, monitoring the space outside the swing path space of the door for detecting moving objects with a sensor, calculating the speed and direction of moving objects outside the swing path space of the door, and braking the opening of the vehicle door when a moving object is travelling towards the swing path space of the door for intervening a collision.

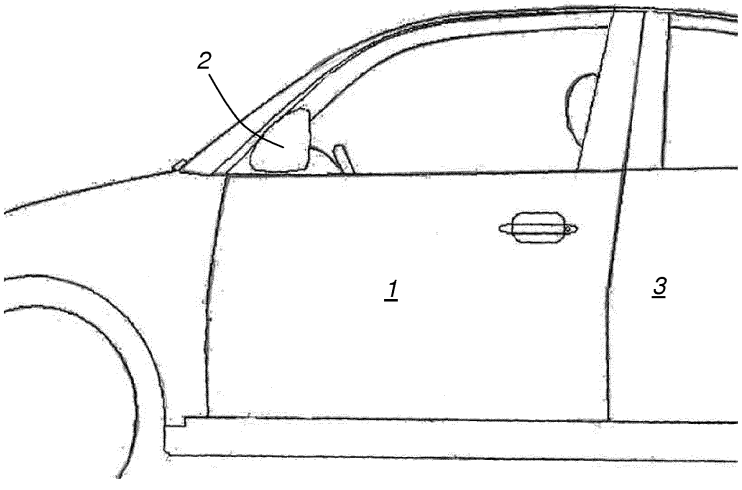

Fig. 1

EP 2 666 945 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a vehicle door stop system for preventing the door being damaged opening it into an object and/or preventing the object being damaged, comprising a control unit, a detecting device and a braking device. The invention also relates to a method for preventing a door of a vehicle hitting an object.

TECHNICAL BACKGROUND

[0002] Many devices have been proposed for an apparatus to sense an object and prevent a vehicle door from being opened and hitting into that object which may cause damage to the door or the object getting hit. However, these devices are limited in their functionality and do not function as effectively as sometimes desired.

[0003] In US 2006/0033612 A1 there is disclosed an improved and universal device to prevent a vehicle door from being damaged by sensing an object and preventing a vehicle door from being opened and contacting the sensed obstruction. The invention disclosed in said document consists of a proximity sensor attached to the edge or part of the door that leads the outward door swing, and would be very close to the first part to come in contact with any surface within the arc of the opening door. The sensor would be connected to a simple electronic control box or relay that will convert the sensor signal into electric power that will activate a device located in the hinge area of the door, which engages a lock to stop the outward swing or opening of the door. It may consist of a gear engaging or a pin engaging device, a friction device, or a hydraulic stop, and may be activated by a solenoid or electric motor. The device may have a positive stop followed by a spring or hydraulic cushion which would prevent any jarring effects by a quick stop of the door. Many override parameters may be built into the system. The entire operation can be temporarily overridden to prevent an inappropriate sensor signal from a person opening the door from the outside, may be turned on and off as desired, and shut down in the event of an accident.

SUMMARY OF THE INVENTION

[0004] The object of the present invention is to provide an improved door stop system. This object is achieved with a door stop system as set forth in the appended claims.

[0005] According to an aspect of the present invention a vehicle door stop system for preventing the door from being damaged opening it into an object and/or preventing the object being damaged, comprises a control unit, a detecting device and a braking device. The detecting device is arranged in the rear side view mirror. Compared to prior where the sensors are arranged on the door side exterior, the sensors being placed in the rear side view mirror will protect them from getting dirty. The function of the sensors in the prior art solution is degraded when dirty. Also, from a design standpoint the placing of sensors on the door side exterior is generally not desirable. The braking device is in this context a braking device for the vehicle door such that it brakes the swing of the vehicle door. Also, braking could in this context be holding or locking the vehicle door in a specific position.

[0006] According to another aspect of the present invention the detecting device is a camera or a radar device. Using this allows for relaying distance and size of an object in the swing path of a vehicle door, thus further allowing for predetermining the stopping position and triggering of the door stop mechanism or brake. Also, using a radar device or a camera allows for stopping the door swing if a moving object outside the vehicle such as a car or cyclist is sensed entering the swing path the side door is about to take. A camera or a radar further has a much larger field of vision which allows for a control system for instance to brake the opening of a door relatively soft since an object could be discovered much earlier than in a system having traditional sensors. Also, because of the larger field of vision only one camera or radar is required on each side of the vehicle rather than a whole set of sensor for each vehicle door.

[0007] According to a further aspect of the present invention the detecting device is a lane keeping / park assist camera or radar device. Those vehicles already equipped with a lane keeping / park assist camera or radar device thus only needs a braking device and a control algorithm for this.

[0008] An audio generator is according to yet another aspect of the present invention connected to the control unit. For instance, it could be a simple alarm sounding to alert the user when the door is about to be opened and there is risk of hitting an object in the door swing path or about to enter the swing path.

[0009] According to an additional aspect of the present invention the braking device comprises a solenoid. Alternatively, the braking device comprises an electric motor.

[0010] According to yet an additional aspect of the present invention a braking device is arranged for each door on the same side of the vehicle as the detecting device. Preferably, there is a braking device for all doors and a detecting device on each side of the vehicle.

[0011] According to a further aspect of the present invention the control unit is arranged to control the maximum opening of all doors on one side of the vehicle using the signals from the detecting device on said side of the vehicle. If, for instance, the front door on one side is opened, the other doors on the same side will be allowed to be opened as much as the front door, unless some object is detected in the swing paths of these other doors before the opening of the front door (normally, there is only one additional door, i.e. at the most two doors on each side).

[0012] According to the present invention a method is

also provided for preventing a door of a vehicle hitting an object or a moving object hitting the door when opening of the door. The method comprises monitoring the swing path space of a door with a sensor arranged on the vehicle, monitoring the space outside the swing path space of the door for detecting moving objects with a sensor, calculating the speed and direction of moving objects outside the swing path space of the door, and braking the opening of the vehicle door when a moving object is travelling towards the swing path space of the door for intervening a collision. Prior art solutions only consider objects present in the swing path of the vehicle door, whereas the solution of the present invention also considers moving objects not immediately present in the swing path but travelling towards the swing path of the vehicle door.

[0013] Preferably the monitoring is carried out using a camera or a radar since they have a better detection range than standard sensors.

[0014] Also, according to a further aspect of the inventive method, the braking of a door is combined with an acoustic signal inside the passenger compartment. As an alternative, the signal could be visual, e.g. an indicator lamp. Also, this signal, visual and/or acoustic could be made to alert the person just upon touching the vehicle door handle in the passenger compartment, i.e. the door would not have to be open to activate the system.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The invention will now be further described with the reference to the drawings in which figure 1 shows a part of the side of a car.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Figure 1 shows a part of a vehicle side with a front door 1 with a rear side view mirror 2 and a rear side door 3. What is also present but not visible is the vehicle door stop system for preventing the door 1 being damaged when opening it in case there is an object in the swing path of the door. Also, it could of course be used for preventing the object being damaged as well. The system comprises a control unit, a detecting device and a braking device that are not visible which is one of the benefits with the present invention, it does not affect the design since the detecting device is arranged in the rear side view mirror 2.

[0017] The detecting device is preferably a camera or a radar. More preferably, if already available a lane keeping (or park assist) camera or radar can be used, i.e. such that no additional device has to be arranged for this function apart of course from the braking device for stopping the swing of the vehicle door.

[0018] Preferably there is also an audio generator or alarm signal for alerting the person wanting to open the door in case there is an object in the swing path of the door or an object, for instance a bicyclist, about to enter the swing path. This "alarm" could of course be varied in several ways. One way is to make it similar to the warning signals of park assist sensors, i.e. the shorter the distance is to an object the shorter the time between the signals is until there is a constant signal.

[0019] A further possibility is to be able to choose if the braking device should actually stop the door at a specific point or just increase the braking power such that it is still possible to push the door further beyond said point.

[0020] In a preferred embodiment the camera or radar is arranged in the side rear view mirror 2 and functions as a sensor for both the front door 1 and the back door 3 and of course the same configuration on the other side of the vehicle. According to one aspect of the invention, the method for preventing a door of a vehicle hitting an object or a moving object hitting the door when opening of the door is beneficial if for instance a bicyclist is travelling towards the swing path of a vehicle door that is to be opened. It is not always easy to see in a side review mirror, especially the distance to an approaching object or to estimate the travelling speed. Also, if the vehicle has back doors the passengers that would like to get out of the vehicle do not any mirror to look into at all for seeing an approaching object.

[0021] The invention is not limited to the specific embodiment presented, but includes all variations within the scope of the present claims. For instance, further functions could be added such as when a vehicle door is opened from the outside of the vehicle, the system will not brake the opening of the door. Without this function it could happen that the system brakes the opening of the door because of the person trying to open the door which of course not is desirable.

Claims

1. A vehicle door stop system for preventing the door (1) being damaged opening it into an object and/or preventing the object being damaged, comprising a control unit, a detecting device and a braking device, **characterized in**
   that the detecting device is arranged in the rear side view mirror (2).

2. A vehicle door stop system according to claim 1, wherein the detecting device is a camera.

3. A vehicle door stop system according to any of the previous claims,
   wherein the detecting device is a lane keeping / park assist camera.

4. A vehicle door stop system according to claim 1, wherein the detecting device is a radar.

5. A vehicle door stop system according to any of claims 1 and 4,
   wherein the detecting device is a lane keeping / park

assist camera.

6. A vehicle door stop system according to any of the previous claims,
wherein it further comprises an audio generator connected to the control unit.

7. A vehicle door stop system according to any of the previous claims,
wherein the braking device comprises a solenoid.

8. A vehicle door stop system according to any of the previous claims,
wherein the braking device comprises an electric motor.

9. A vehicle door stop system according to any of the previous claims,
wherein a braking device is arranged for each door (1, 3) on the same side of the vehicle as the detecting device.

10. A vehicle door stop system according to claim 9, wherein the control unit is arranged to control the maximum opening of all doors (1, 3) on one side of the vehicle using the signals from the detecting device on said side of the vehicle.

11. A method for preventing a door (1, 3) of a vehicle hitting an object or a moving object hitting the door when opening of the door, the method comprising:

- monitoring the swing path space of a door with a sensor arranged on the vehicle;
- monitoring the space outside the swing path space of the door for detecting moving objects with a sensor;
- calculating the speed and direction of moving objects outside the swing path space of the door; and
- braking the opening of the vehicle door when a moving object is travelling towards the swing path space of the door for intervening a collision.

12. A method according to claim 11, wherein the monitoring is carried out using a camera or a radar.

13. A method according to any of claims 11 and 12, wherein the braking of a door is combined with an acoustic signal inside the passenger compartment.

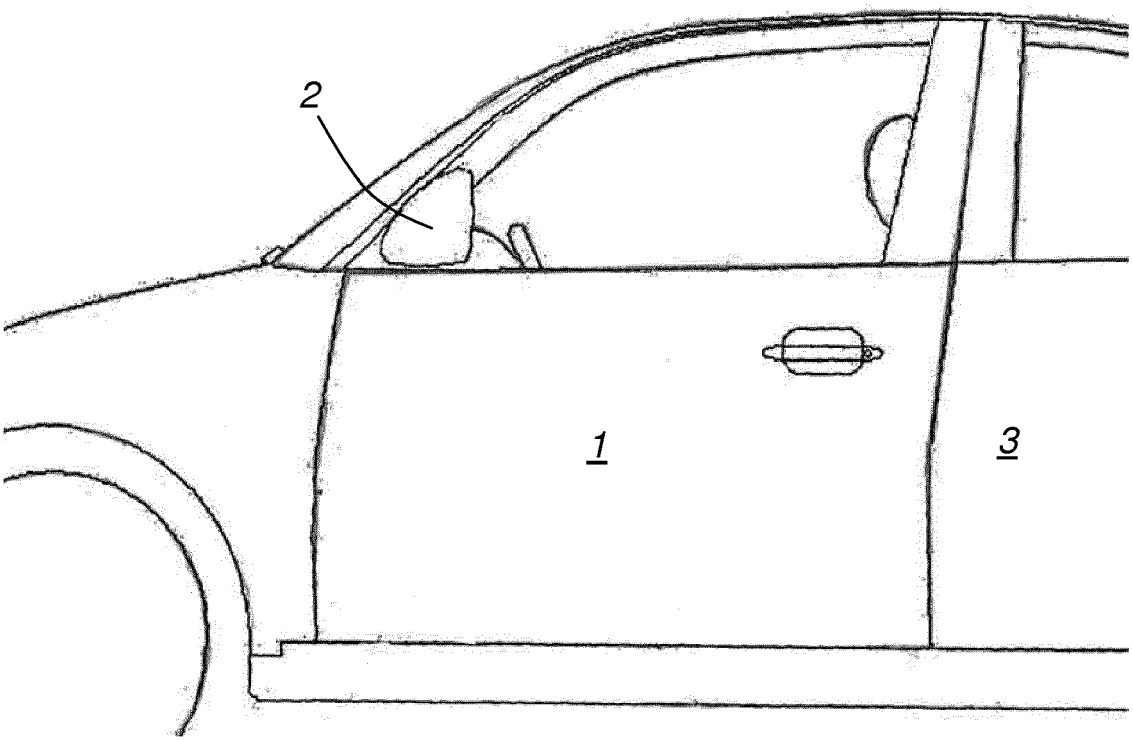

Fig. 1

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 12 16 9412

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	DE 102 29 033 A1 (BOSCH GMBH ROBERT [DE]) 22 January 2004 (2004-01-22) * column 2, line 44 - line 50 * * column 3, line 11 - line 19 * * column 3, line 30 - line 34 * * column 3, line 51 - column 4, line 1 * * claim 12 * * figure 1 * -----	1-6,9-13 7,8	INV. E05F5/00 E05F15/00
X	DE 10 2011 013766 A1 (DAIMLER AG [DE]) 12 January 2012 (2012-01-12) * paragraph [0001] * * paragraph [0025] * * paragraph [0034] * * paragraph [0036] * * paragraph [0038] - paragraph [0039] * * claims 2-3 * -----	1-5,9-12	
X	DE 103 48 917 A1 (DAIMLER CHRYSLER AG [DE]) 25 May 2005 (2005-05-25) * paragraph [0001] * * paragraph [0005] * * paragraph [0018] * * claim 1 * * figures 1-3 * -----	1,9,10	TECHNICAL FIELDS SEARCHED (IPC) E05F
X	DE 195 37 619 A1 (SCHILLER ROLF DIPL ING [DE]) 17 April 1997 (1997-04-17) * page 2, line 3 - line 5 * * page 2, line 48 - line 49 * * page 3, line 22 - line 24 * * page 3, line 33 - line 47 * * figure 1 * -----	11-13	

-/--

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 October 2012	Prieto, Daniel

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 12 16 9412

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 2 284 345 A1 (VALEO SICHERHEITSSYSTEME GMBH [DE]) 16 February 2011 (2011-02-16) * paragraph [0038] * * paragraph [0049] * * figures 2-3 *	7	
Y	DE 10 2009 041036 A1 (BROSE FAHRZEUGTEILE [DE]) 24 March 2011 (2011-03-24) * paragraph [0035] * * figures 1, 2A *	8	
A	WO 2004/071815 A1 (SIEMENS AG [DE]; DAS CHANDAN [DE]; FRENZEL HENRYK [DE]; HAMANN CHRISTO) 26 August 2004 (2004-08-26) * page 10, line 17 - line 29 * * page 11, line 28 - page 12, line 3 * * page 12, line 30 - line 37 * * figure 1 *	1-13	
			TECHNICAL FIELDS SEARCHED (IPC)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 October 2012	Prieto, Daniel

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 16 9412

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-10-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 10229033 A1	22-01-2004	DE 10229033 A1	22-01-2004
		EP 1375267 A2	02-01-2004
DE 102011013766 A1	12-01-2012	NONE	
DE 10348917 A1	25-05-2005	DE 10348917 A1	25-05-2005
		WO 2005044639 A1	19-05-2005
DE 19537619 A1	17-04-1997	NONE	
EP 2284345 A1	16-02-2011	NONE	
DE 102009041036 A1	24-03-2011	NONE	
WO 2004071815 A1	26-08-2004	EP 1594727 A1	16-11-2005
		US 2006254142 A1	16-11-2006
		WO 2004071815 A1	26-08-2004

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 20060033612 A1 **[0003]**