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Fujiwara

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(54) **VEHICLE OCCUPANT PROTECTION SYSTEM**

(71) Applicant: **TOYOTA JIDOSHA KABUSHIKI KAISHA**, Toyota-shi, Aichi-ken (JP)

(72) Inventor: **Yusuke Fujiwara**, Toyota (JP)

(73) Assignee: **TOYOTA JIDOSHA KABUSHIKI KAISHA**, Toyota (JP)

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,499,840 A	3/1996	Nakano	
5,860,673 A *	1/1999	Hasegawa	B60R 21/207 280/728.3
5,988,674 A *	11/1999	Kimura	B60R 21/207 280/728.3
5,997,032 A	12/1999	Miwa et al.	
7,401,806 B2 *	7/2008	Tracht	B60R 21/207 280/728.3
7,637,529 B2 *	12/2009	Tracht	B60R 21/207 280/728.2
8,152,197 B2 *	4/2012	Taguchi	B60R 21/207 280/728.2
8,282,126 B2	10/2012	Wiik et al.	
2005/0156412 A1 *	7/2005	Panagos	B60R 21/201 280/730.2
2006/0113756 A1 *	6/2006	Tracht	B60N 2/5883 280/730.1

(Continued)

FOREIGN PATENT DOCUMENTS

JP	H07-267037 A	10/1995
JP	H10-250522 A	9/1998

(Continued)

Primary Examiner — Drew Brown

(74) Attorney, Agent, or Firm — Oliff PLC

(57) **ABSTRACT**

A vehicle occupant protection system includes: an outside airbag; reinforcement cloths that are attached to a reverse surface of a seat cover, in a region at a the vehicle width direction outer side, and a region at a seat front side, of the outside airbag, the reinforcement cloths being attached from an outside splitting portion; an inside airbag; webbings that are secured to a side frame (a frame) of a seat back, with each having an end portion fastened to an inside splitting portion; an outside inflator that supplies a gas for inflation to the seat outside airbag; an inside inflator that supplies a gas for inflation to the seat inside airbag; and a control unit which, at a time of a side crash, actuates the inside inflator later than the outside inflator.

11 Claims, 13 Drawing Sheets

