US009636962B2

(12) **United States Patent**
Schallmeier

(10) **Patent No.: US 9,636,962 B2**
(45) **Date of Patent: May 2, 2017**

(54) **BONDED GUIDE TUBE AND BELLOW ASSEMBLY FOR AIR SPRING**

(71) Applicant: **Continental Automotive Systems, Inc.**, Auburn Hills, MI (US)

(72) Inventor: **Christian Schallmeier**, Lake Orion, MI (US)

(73) Assignee: **Continental Automotive Systems, Inc.**, Auburn Hills, MI (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/488,333**

(22) Filed: **Sep. 17, 2014**

(65) **Prior Publication Data**

US 2016/0075203 A1 Mar. 17, 2016

(51) **Int. Cl.**

B60G 11/27	(2006.01)
B29C 65/48	(2006.01)
F16F 9/04	(2006.01)
B29K 63/00	(2006.01)
B29L 31/30	(2006.01)

(52) **U.S. Cl.**

CPC ***B60G 11/27*** (2013.01); ***B29C 65/483*** (2013.01); ***F16F 9/0436*** (2013.01); ***F16F 9/0454*** (2013.01); *B29K 2063/00* (2013.01); *B29L 2031/3055* (2013.01); *B60G 2202/152* (2013.01); *B60G 2206/821* (2013.01); *F16F 2226/042* (2013.01)

(58) **Field of Classification Search**

CPC B60G 2202/152; B60G 2206/821; F16F 2226/042; F16F 9/0454

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,460,354	A *	10/1995	Easter	B60G 15/12 188/322.12
8,272,627	B2	9/2012	Oldenettel et al.	
8,474,798	B2	7/2013	Jeischik	
2010/0001446	A1*	1/2010	Oldenettel	F16F 9/0445 267/122
2013/0300074	A1*	11/2013	Koeske	B60G 11/27 280/6.157

FOREIGN PATENT DOCUMENTS

DE	29823508	U1	8/1999	
DE	EP 0969222	A1 *	1/2000	B29C 66/1122
DE	2004021594	A1	12/2005	
DE	102008015610	A1	10/2009	
EP	2407686	A2	1/2012	
WO	2013010470	A1	7/2013	

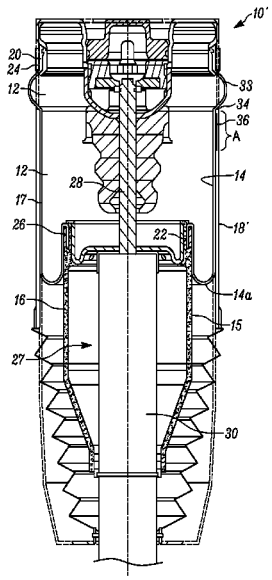
OTHER PUBLICATIONS

Abstract for EP969222.*
Machine translation of DE 102008015610.*
European Patent Office Search Report dated Feb. 24, 2016.

* cited by examiner

Primary Examiner — Christopher Schatz

(57) **ABSTRACT**

An air spring includes a bellow at least partially delimiting at least one working chamber that is constructed and arranged to be filled with compressed air. A guide tube surrounds at least a portion of the bellow. A bonding agent solely fixes a portion of the bellow to the guide tube. A piston is associated with the bellow. The bellow is constructed and arranged to roll with respect to an outer surface of the piston and an inner surface of the guide tube.

4 Claims, 3 Drawing Sheets