



US009086285B2

(12) **United States Patent**
Gupta et al.

(10) **Patent No.:** **US 9,086,285 B2**
(45) **Date of Patent:** **Jul. 21, 2015**

(54) **AUTOMATIC DETECTION OF PARKING LEVEL IN MULTI-LEVEL STRUCTURE**

USPC 701/500, 300, 529, 1, 517; 340/539.13, 340/988, 932.2
See application file for complete search history.

(71) Applicant: **GENERAL MOTORS LLC**, Detroit, MI (US)

(56) **References Cited**

(72) Inventors: **Mukesh Gupta**, Farmington, MI (US); **Marco T. Carnevale**, Windsor (CA); **Sanjay Khunger**, Brighton, MI (US); **Santhosh Kumar Narayanan**, Troy, MI (US); **Joseph S. Niemiec**, Southgate, MI (US)

U.S. PATENT DOCUMENTS

4,424,651 A * 1/1984 Lee et al. 52/175
7,266,927 B2 * 9/2007 Higgs 52/175
2006/0228196 A1 * 10/2006 Li 414/227
2007/0294952 A1 * 12/2007 Li 52/30

* cited by examiner

(73) Assignee: **General Motors LLC**, Detroit, MI (US)

Primary Examiner — Gertrude Arthur Jeanglaude

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 64 days.

(74) *Attorney, Agent, or Firm* — Leydig, Voit & Mayer, Ltd.

(21) Appl. No.: **13/972,456**

(57) **ABSTRACT**

(22) Filed: **Aug. 21, 2013**

Implementations of the present invention contemplate utilizing the communicative connections between a telematics service provider (TSP), a communication device, and a telematics unit in a vehicle parked in a multilevel parking garage to determine location information of the vehicle and to provide such information to a subscriber of the TSP. A subscriber of a TSP may transmit a request for information pertaining to the location of a vehicle parked within a multilevel parking structure from a communication device. Upon the receipt of such a request, the TSP provides the information requested by the subscriber. In various implementations, the providing of such information by the TSP may involve querying the telematics unit in the vehicle or querying a database storing location information pertaining to one or more vehicles and may further involve performing calculations to derive the information requested by the communication device. In some implementations, the information requested by the communication device includes but is not limited to a floor number, or level, of the parking garage on which the telematics-equipped vehicle is parked.

(65) **Prior Publication Data**

US 2015/0057926 A1 Feb. 26, 2015

(51) **Int. Cl.**

G01C 21/10 (2006.01)
G01C 21/16 (2006.01)
G08G 1/00 (2006.01)
G08G 1/14 (2006.01)
E04H 6/08 (2006.01)

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

CPC **G01C 21/165** (2013.01); **G08G 1/205** (2013.01); **E04H 6/08** (2013.01); **G08G 1/14** (2013.01)

(58) **Field of Classification Search**

CPC E04H 6/08; E04H 6/28; G08G 1/14; G08G 1/205; B60R 25/33; G07B 15/02

18 Claims, 5 Drawing Sheets

