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(54) **BUILDING URBAN AREA NOISE POLLUTION MAPS AND MITIGATING NOISE FROM EMERGENCY VEHICLES**

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(56) **References Cited**

U.S. PATENT DOCUMENTS

8,918,343	B2 *	12/2014	Mitchell	G10L 25/48 706/12
9,961,435	B1 *	5/2018	Goyal	G10L 25/84
10,034,083	B2 *	7/2018	Bostick	H04R 1/406
2010/0088093	A1 *	4/2010	Lee	G10L 15/22 704/233
2013/0259250	A1 *	10/2013	Nicholson	G10K 11/17823 381/71.6
2014/0142958	A1 *	5/2014	Sharma	G10L 19/02 704/500
2015/0110276	A1 *	4/2015	Gereb	G01H 3/125 381/56
2015/0241871	A1 *	8/2015	Yoshino	G05B 19/4185 702/81
2017/0099556	A1 *	4/2017	Cierna	H04R 29/004

(Continued)

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(57) **ABSTRACT**

Constructing a noise pollution map for an area includes a first subset of users performing initial noise recordings in the area using audio devices, using machine learning to provide classification of noises in the initial noise recordings, a second subset of users, larger than the first subset of users, capturing noise in the area using audio devices, creating summaries of noises using the classification to classify noises captured by the second subset of users, and aggregating the summaries to construct the noise pollution map of the area. The audio devices may include headsets, smart speakers, smart television sets, and/or computers. The summaries of noises may be created using software that is installed locally on devices of the second subset of users. The summaries may include source information, amplitude and frequency characteristics, duration, parameters of a corresponding one of the audio devices, user location, surroundings, and/or user movement information.

25 Claims, 5 Drawing Sheets