US009398367B1

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

(10) **Patent No.: US 9,398,367 B1**
(45) **Date of Patent: Jul. 19, 2016**

(54) **SUSPENDING NOISE CANCELLATION USING KEYWORD SPOTTING**

(71) Applicant: **Amazon Technologies, Inc.**, Reno, NV (US)

(72) Inventors: **Benjamin David Scott**, Cambridge (GB); **Mark Edward Rafn**, Cambridge (GB)

(73) Assignee: **Amazon Technologies, Inc.**, Seattle, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 31 days.

(21) Appl. No.: **14/341,222**

(22) Filed: **Jul. 25, 2014**

(51) **Int. Cl.**

A61F 11/06	(2006.01)
G10K 11/16	(2006.01)
H03B 29/00	(2006.01)
H04R 3/02	(2006.01)
H04R 1/10	(2006.01)
H04B 15/00	(2006.01)

(52) **U.S. Cl.**
CPC ***H04R 1/1083*** (2013.01); *H04R 2460/01* (2013.01)

(58) **Field of Classification Search**
CPC A61F 11/06; G10K 11/175; H04R 1/10; H04R 1/28; H04R 1/1083; H04R 1/1091; H04R 5/033; H04R 25/00; H04R 25/75; H04R 2400/01; H04R 2410/00; H04R 2410/01; H04R 2460/01
USPC 381/41, 42, 43, 46, 71.1, 71.6, 72, 73.1, 381/74, 94.1, 370
See application file for complete search history.

(56) **References Cited**

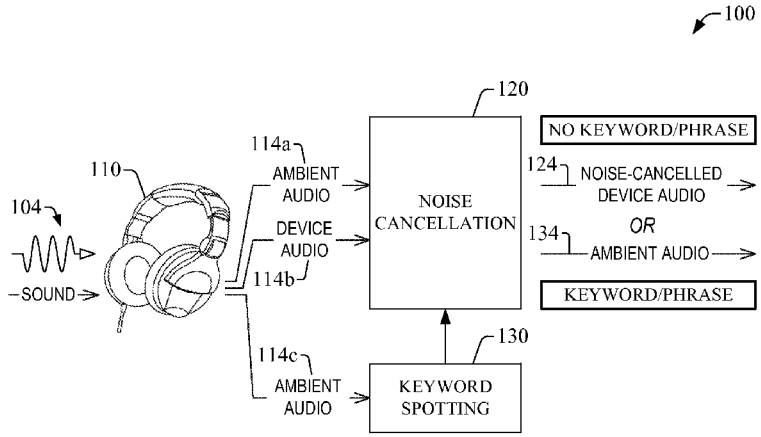
U.S. PATENT DOCUMENTS

5,812,659	A *	9/1998	Mauney	H04M 1/05 379/430
7,068,798	B2 *	6/2006	Hugas	G10L 21/0208 381/86
8,504,360	B2 *	8/2013	Pedersen	G10L 21/0208 381/73.1
9,031,250	B2 *	5/2015	Ookuri	G10K 11/178 381/71.1
2004/0002858	A1 *	1/2004	Attias	G10L 21/02 704/226
2008/0243504	A1 *	10/2008	Poi	G10L 15/063 704/247
2010/0226505	A1 *	9/2010	Kimura	G10K 11/1788 381/71.6
2011/0046948	A1 *	2/2011	Pedersen	G10L 21/0208 704/231
2011/0145000	A1 *	6/2011	Hoepken	G10L 15/22 704/275
2012/0308022	A1 *	12/2012	Ookuri	G10K 11/178 381/71.1
2013/0345842	A1 *	12/2013	Karakaya	H04R 5/04 700/94
2014/0064511	A1 *	3/2014	Desai	H04R 1/1041 381/74

(Continued)

Primary Examiner — Khai N Nguyen
(74) *Attorney, Agent, or Firm* — Sutherland Asbill & Brennan LLP

(57) **ABSTRACT**

Aspects of the disclosure provide suspension of noise cancellation at a noise-cancelling device using keyword spotting. In one aspect, a predetermined word or phrase can be spotted within an utterance received at the noise-cancelling device, and in response, noise cancellation can be suspended or otherwise terminated. The predetermined word or phrase can be specific to an end-user that utilizes the noise-cancelling device and/or a person that interacts with the end-user. In another aspect, interaction between an operator and the noise-cancelling device can be monitored after noise cancellation is suspended, and based at least on such interaction, a model for keyword spotting can be refined. In certain aspects, noise cancellation at the noise-cancelling device can be suspended or otherwise terminated in response to receiving a suspension directive via an electronic non-audio signal, for example, from a peripheral device. In other aspects, the noise-cancelling device can resume noise cancellation in response to a control signal.

21 Claims, 6 Drawing Sheets