



US010137402B2

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

(10) **Patent No.:** US 10,137,402 B2

(45) **Date of Patent:** Nov. 27, 2018

(54) **GAS CONCENTRATION DEVICE**

USPC ..... 96/121  
See application file for complete search history.

(71) Applicant: **OXUS CO., LTD.**, Gyeonggi-do (KR)

(72) Inventors: **Tae Soo Lee**, Gyeonggi-do (KR);  
**Hyeon Seong Kim**, Gyeonggi-do (KR);  
**Shin Kyu Han**, Seoul (KR); **Seung Kwon Oh**, Hanam-si (KR); **Loren Mitchell Thompson**, Lapeer, MI (US)

(73) Assignee: **OXUS CO., LTD.**, Gyeonggi-do (KR)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 115 days.

(21) Appl. No.: **15/433,630**

(22) Filed: **Feb. 15, 2017**

(65) **Prior Publication Data**

US 2018/0229176 A1 Aug. 16, 2018

(51) **Int. Cl.**  
**B01D 53/047** (2006.01)  
**B01D 53/04** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **B01D 53/047** (2013.01); **B01D 53/0423** (2013.01); **B01D 2253/108** (2013.01); **B01D 2256/12** (2013.01); **B01D 2257/102** (2013.01); **B01D 2259/402** (2013.01); **B01D 2259/40007** (2013.01); **B01D 2259/40035** (2013.01); **B01D 2259/4533** (2013.01)

(58) **Field of Classification Search**  
CPC ..... B01D 53/047; B01D 53/0423; B01D 2253/108; B01D 2256/12; B01D 2257/102; B01D 2259/40007; B01D 2259/40035; B01D 2259/402; B01D 2259/4533

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,071,453 A \* 12/1991 Hradek ..... A62B 7/14  
95/19  
5,354,361 A \* 10/1994 Coffield ..... B01D 53/047  
95/103  
5,988,165 A \* 11/1999 Richey, II ..... A61M 16/10  
128/204.22  
7,550,031 B2 \* 6/2009 Hunter ..... B01D 53/04  
95/130

\* cited by examiner

Primary Examiner — Frank M Lawrence, Jr.

(74) Attorney, Agent, or Firm — Rabin & Berdo, P.C.

(57) **ABSTRACT**

A gas concentration device according to an embodiment of the present invention includes: an air supplier supplying pressurized air; a plurality of adsorption beds which separate pressurized air supplied from the air supplier into product gas and purge gas by a pressure swing adsorption method and discharge the separated product gas and purge gas; a flow passage regulating valve unit which regulates flow passages so as to allow the pressurized air to be supplied to the adsorption bed from the air supplier and so as to reduce pressure of the adsorption bed so that a nitrogen adsorption process and a nitrogen desorption process are alternately performed; and a pressure boosting unit which is configured to be fed with the purge gas and the product gas discharged from the adsorption bed and is configured to pressurize the product gas in multi-stage sequentially using the purge gas and the product gas.

**11 Claims, 7 Drawing Sheets**

