



(12) **United States Patent**  
**Cowan**

(10) **Patent No.:** **US 9,408,981 B2**  
(45) **Date of Patent:** **Aug. 9, 2016**

- (54) **ADJUSTABLE VOLUME SYRINGE**
- (71) Applicant: **MEDRAD, INC.**, Indianola, PA (US)
- (72) Inventor: **Kevin P. Cowan**, Allison Park, PA (US)
- (73) Assignee: **Bayer HealthCare LLC**, Whippany, NJ (US)

4,188,949 A 2/1980 Antoshkiw  
 5,032,117 A \* 7/1991 Motta ..... A61M 5/14  
 604/187  
 5,300,041 A 4/1994 Haber et al.  
 5,512,054 A 4/1996 Morningstar  
 5,522,804 A 6/1996 Lynn

(Continued)

**FOREIGN PATENT DOCUMENTS**

EP 2222358 9/2010  
 WO 2012006555 A1 12/2012

**OTHER PUBLICATIONS**

International Search Report for Counterpart PCT Application No. PCT/US2014/022383.

(Continued)

- (\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 557 days.

(21) Appl. No.: **13/792,158**

(22) Filed: **Mar. 10, 2013**

(65) **Prior Publication Data**

US 2014/0257233 A1 Sep. 11, 2014

- (51) **Int. Cl.**  
**A61M 31/00** (2006.01)  
**A61M 5/315** (2006.01)  
**A61M 5/178** (2006.01)  
**A61M 5/20** (2006.01)

- (52) **U.S. Cl.**  
 CPC ..... **A61M 5/31563** (2013.01); **A61M 5/31596** (2013.01); **A61M 5/1785** (2013.01); **A61M 5/20** (2013.01); **A61M 5/31561** (2013.01); **A61M 2005/1787** (2013.01); **A61M 2005/31598** (2013.01); **A61M 2205/50** (2013.01); **A61M 2205/505** (2013.01); **A61M 2205/52** (2013.01)

- (58) **Field of Classification Search**  
 CPC ..... A61M 5/31565; A61M 5/31596; A61M 2005/31598; A61M 5/1785; A61M 2205/52; A61M 5/31561; A61M 2005/1781; A61M 2205/50

See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

984,037 A 2/1911 Sheets  
 2,869,543 A 1/1959 Ratcliff et al.

*Primary Examiner* — Nathan R Price  
*Assistant Examiner* — Morgan Lee  
 (74) *Attorney, Agent, or Firm* — Joseph L. Kent; David Schramm; James R. Stevenson

(57) **ABSTRACT**

Adjustable volume syringes and systems are disclosed. An adjustable volume syringe includes a delivery syringe barrel, a reservoir syringe barrel positioned at least partially within the delivery syringe barrel, and a reservoir plunger positioned at least partially within the reservoir syringe barrel. The delivery syringe barrel is configured to contain a first amount of a fluid. The reservoir syringe barrel is configured to contain a second amount of the fluid. A system includes the adjustable volume syringe, a dispensing module in communication with the syringe, and a processor in communication with the dispensing module. The processor may be configured to determine an administration amount of the fluid in the adjustable volume syringe, and transmit signals causing the dispensing module to adjust the volume of fluid in the syringe to the administration amount and deliver the administration amount by moving the reservoir syringe barrel with respect to the delivery syringe barrel.

**14 Claims, 7 Drawing Sheets**

