

US011000653B2

(12) United States Patent

Calderon Oliveras et al.

(54) INHALER

(71) Applicant: Norton (Waterford) Limited, Waterford (IE)

(72) Inventors: Enrique Calderon Oliveras, Waterford

(IE); Daniel Buck, Waterford (IE); Erica Jamie Kantor, Cambridge (GB); Ross William Weir, Cambridge (GB); James Roche, Enniscorthy (IE); Steven David Gardner, Peterborough (GB); Robert Owen Kivlin, Cambridge (GB)

(73) Assignee: Norton (Waterford) Limited,

Waterford (IE)

(*) Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35

U.S.C. 154(b) by 460 days.

(21) Appl. No.: 15/704,444

(22) Filed: Sep. 14, 2017

(65) Prior Publication Data

US 2018/0140788 A1 May 24, 2018

Related U.S. Application Data

(60) Provisional application No. 62/424,299, filed on Nov. 18, 2016.

(51) **Int. Cl.**

A61M 15/00 (2006.01) **A61B 5/00** (2006.01)

(52) U.S. Cl.

CPC A61M 15/0023 (2014.02); A61B 5/4833 (2013.01); A61M 15/0025 (2014.02);

(Continued)

(10) Patent No.: US 11,000,653 B2

(45) **Date of Patent:** May 11, 2021

(58) Field of Classification Search

CPC A61M 16/008; A61M 16/0001; A61M 16/0023; A61M 16/0025;

(Continued)

(56) References Cited

U.S. PATENT DOCUMENTS

(Continued)

FOREIGN PATENT DOCUMENTS

EP 1135056 B1 8/2006 EP 1992381 A1 11/2008 (Continued)

Primary Examiner — Joseph D. Boecker Assistant Examiner — Thomas W Greig

(74) Attorney, Agent, or Firm — Flaster Greenberg, P.C.

(57) ABSTRACT

The introduction of electronics into a drug delivery device may introduce certain technical challenges, such as durability, electro-mechanical integration, and drug delivery performance. The present disclosure provides solutions for inclusion of an electronics module with an inhaler. For example, heat stakes may be used to secure a printed circuit board (PCB) to an electronics module's housing. Also for example, a slider may be used to transfer vertical movement of an inhaler's yoke to an electronics module's switch. Also for example, certain seals may be used when interfacing the electronics module to other portions of the device's housing to achieve a desired performance.

26 Claims, 13 Drawing Sheets

