

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

(10) **Patent No.:** **US 9,410,653 B2**
(45) **Date of Patent:** **Aug. 9, 2016**

(54) **HYDRAULIC FLOW-RATE REGULATING DEVICE**

(75) Inventors: **Roberto Bosio**, Turin (IT); **Paolo Ravedati**, Turin (IT); **Maurizio Rendesi**, Turin (IT); **Giorgio Molino**, Turin (IT)

(73) Assignee: **ELBI INTERNATIONAL S.P.A.**, Turin (IT)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 283 days.

(21) Appl. No.: **14/131,464**

(22) PCT Filed: **Jul. 12, 2012**

(86) PCT No.: **PCT/IB2012/053566**
§ 371 (c)(1), (2), (4) Date: **Jan. 8, 2014**

(87) PCT Pub. No.: **WO2013/008199**
PCT Pub. Date: **Jan. 17, 2013**

(65) **Prior Publication Data**
US 2014/0137970 A1 May 22, 2014

(30) **Foreign Application Priority Data**
Jul. 13, 2011 (IT) TO2011A0615

(51) **Int. Cl.**
F16L 55/027 (2006.01)
G05D 7/01 (2006.01)

(52) **U.S. Cl.**
CPC **F16L 55/027** (2013.01); **G05D 7/012** (2013.01)

(58) **Field of Classification Search**
CPC F16L 55/027; G05D 7/12
USPC 138/140–146
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,630,455 A * 12/1971 Parkison B05B 1/323
137/504
4,000,857 A * 1/1977 Moen B05B 1/3006
137/860

(Continued)

FOREIGN PATENT DOCUMENTS

DE 24 03 084 A1 7/1975
DE 295 20 069 U1 3/1996

(Continued)

OTHER PUBLICATIONS

International Search Report of PCT/IB2012/053566 dated Oct. 5, 2012.

Primary Examiner — Paul R Durand

Assistant Examiner — Vishal Pancholi

(74) *Attorney, Agent, or Firm* — Sughrue Mion, PLLC

(57) **ABSTRACT**

The regulating device (1) comprises a body (2) including a hub (3) which has a first end (3a) connected to a surrounding ring (4), such as to define therebetween at least one passage (6) for the fluid, between the upstream and downstream regions, and the other or second end (3b) of which protrudes with respect to the ring (4). The ring (4) has, on a surface thereof, an annular distribution of projections (7). On the second end (3b) of the hub (3) there is mounted a flexible, ring-shaped, regulating member (8) facing and spaced from the tops of said projections (7) and capable during use of resiliently flexing towards them as a result of and depending on the difference in pressure between the upstream and downstream regions. The ring (4) is further provided with a plurality of restricted holes (10) having a fluid flow parallel to the at least one passage (6). These restricted holes (10) are formed essentially in the same radial portion (C) of the ring (4) in which the projections (7) are provided such that the holes (10) are circumferentially and radially comprised each between a pair of projections (7).

12 Claims, 8 Drawing Sheets

