



US010815574B2

(12) **United States Patent**
Snow et al.(10) **Patent No.: US 10,815,574 B2**(45) **Date of Patent: Oct. 27, 2020**(54) **COATED ARTICLE AND RELATED METHODS**
(71) Applicant: **ND Industries, Inc.**, Clawson, MI (US)
(72) Inventors: **Gerald F. Snow**, Almont, MI (US);
Christopher T. Hable, Romeo, MI (US); **Scot Wickham**, Clawson, MI (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 135 days.

(21) Appl. No.: **15/862,867**(22) Filed: **Jan. 5, 2018**(65) **Prior Publication Data**
US 2018/0195180 A1 Jul. 12, 2018**Related U.S. Application Data**

(60) Provisional application No. 62/443,195, filed on Jan. 6, 2017.

(51) **Int. Cl.**
C23F 11/173 (2006.01)
C09D 177/02 (2006.01)
C09D 7/63 (2018.01)
C09D 5/08 (2006.01)
C09D 7/40 (2018.01)
C09D 5/03 (2006.01)
C09D 177/06 (2006.01)
C09D 163/00 (2006.01)
B05D 1/12 (2006.01)
B05D 3/02 (2006.01)
C08K 7/24 (2006.01)(52) **U.S. Cl.**
CPC **C23F 11/173** (2013.01); **C09D 5/033** (2013.01); **C09D 5/08** (2013.01); **C09D 7/63** (2018.01); **C09D 7/70** (2018.01); **C09D 163/00** (2013.01); **C09D 177/02** (2013.01); **C09D 177/06** (2013.01); **B05D 1/12** (2013.01); **B05D 3/0218** (2013.01); **B05D 2202/00** (2013.01); **B05D 2601/20** (2013.01); **C08K 7/24** (2013.01)(58) **Field of Classification Search**
CPC C23F 11/173
See application file for complete search history.(56) **References Cited**
U.S. PATENT DOCUMENTS4,407,914 A * 10/1983 Inoue H01M 2/08
429/174
5,304,023 A * 4/1994 Toback F16B 33/004
411/387.35,336,304 A * 8/1994 Andoe C09D 5/1662
106/15.05
5,426,130 A 6/1995 Thurber et al.
5,441,373 A * 8/1995 Kish F16B 15/0092
411/258
5,571,312 A * 11/1996 Andoe C08G 59/226
106/18.32
5,651,824 A 7/1997 Wallace et al.
5,656,325 A 8/1997 Wallace
5,672,376 A 9/1997 Wallace
5,679,160 A 10/1997 Wallace et al.
5,928,711 A 7/1999 Wallace et al.
5,964,551 A 10/1999 Wallace
6,027,568 A 2/2000 Wallace et al.
6,270,838 B1 8/2001 Wallace et al.
6,322,628 B1 11/2001 Wallace
6,474,919 B2 11/2002 Wallace et al.
6,817,816 B2 11/2004 Hill
7,404,483 B2 7/2008 Wallace
7,521,402 B2 4/2009 Combetta
7,771,148 B2 8/2010 Phillips
7,772,316 B2 8/2010 Barr
7,878,744 B2 2/2011 Snow et al.
8,865,794 B2 10/2014 Wallace et al.
8,865,812 B2 10/2014 Phillips
2003/0092789 A1 * 5/2003 Jin C08K 3/22
522/81
2007/0225444 A1 * 9/2007 Barr C08L 77/00
525/178
2014/0199135 A1 7/2014 Hable et al.
2015/0014126 A1 1/2015 Snow
2015/0056394 A1 2/2015 Rawls
2016/0222222 A1 8/2016 Stupar et al.

FOREIGN PATENT DOCUMENTS

CA 2632482 A1 11/2008
WO WO9966219 A1 12/1999
WO WO2008073262 A1 6/2008
WO WO2008094535 A1 8/2008
WO WO2008094537 A2 8/2008
WO WO2008153866 A1 12/2008
WO WO2008153868 A1 12/2008

* cited by examiner

Primary Examiner — Megan McCulley
(74) *Attorney, Agent, or Firm* — Warner Norcross + Judd
LLP(57) **ABSTRACT**

A coated article comprises an article comprising a surface and a galvanic barrier coating disposed on the surface. The galvanic barrier coating is formed from a galvanic barrier coating composition comprising (a) a thermoplastic resin, (b) an epoxy-based resin, (c) a curing agent, and (d) non-compressible, non-marring microsphere particles. Methods of preparing and using the coated article are also disclosed.

17 Claims, No Drawings