US006540815B1

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

(10) **Patent No.: US 6,540,815 B1**
(45) **Date of Patent: Apr. 1, 2003**

(54) **METHOD FOR REDUCING EMISSIONS FROM EVAPORATIVE EMISSIONS CONTROL SYSTEMS**

(75) Inventors: **Laurence H. Hiltzik**, Charleston, SC (US); **Jacek Z. Jagiello**, Charleston, SC (US); **Edward D. Tolles**, Charleston, SC (US); **Roger S. Williams**, Lexington, VA (US)

(73) Assignee: **MeadWestvaco Corporation**, Stamford, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/100,362**

(22) Filed: **Mar. 18, 2002**

Related U.S. Application Data

(60) Provisional application No. 60/335,897, filed on Nov. 21, 2001.

(51) **Int. Cl.**[7] **F02M 33/02**; B01D 53/04

(52) **U.S. Cl.** **95/146**; 95/900; 123/519

(58) **Field of Search** 95/90, 146, 148, 95/900–903; 96/132, 133, 147; 123/518, 519; 502/416

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,677,086	A	*	6/1987	McCue et al.	123/519
4,894,072	A	*	1/1990	Turner et al.	123/519
5,204,310	A	*	4/1993	Tolles et al.	123/519
5,206,207	A	*	4/1993	Tolles	502/423
5,207,808	A	*	5/1993	Haruta et al.	123/519
5,238,470	A	*	8/1993	Tolles et al.	95/143
5,250,491	A	*	10/1993	Yan	264/117
5,276,000	A	*	1/1994	Matthews et al.	502/424
5,304,527	A	*	4/1994	Dimitri	502/416
5,324,703	A	*	6/1994	McCue et al.	502/424
5,337,721	A	*	8/1994	Kasuya et al.	123/519
5,408,976	A	*	4/1995	Reddy	123/198 D
5,416,056	A	*	5/1995	Baker	502/425
5,456,236	A	*	10/1995	Wakashiro et al.	123/519

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

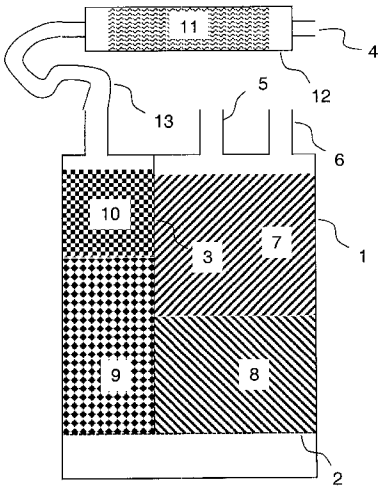
EP	11 13163		7/2001
KR	2002012826 A	*	2/2002
WO	WO 92/01585		9/1992
WO	WO 01/62367		8/2001

Primary Examiner—David A. Simmons
Assistant Examiner—Frank M. Lawrence
(74) *Attorney, Agent, or Firm*—Terry B. McDaniel; Daniel B. Reece, IV; Thomas A. Boshinski

(57) **ABSTRACT**

Disclosed is a method for sharply reducing diurnal breathing loss emissions from automotive evaporative emissions control systems by providing multiple layers, or stages, of adsorbents. On the fuel source-side of an emissions control system canister, high working capacity carbons are preferred in a first canister (adsorb) region. In subsequent canister region(s) on the vent-side, the preferred adsorbent should exhibit a flat or flattened adsorption isotherm on a volumetric basis and relatively lower capacity for high concentration vapors as compared with the fuel source-side adsorbent. Multiple approaches are described for attaining the preferred properties for the vent-side canister region. One approach is to use a filler and/or voidages as a volumetric diluent for flattening an adsorption isotherm. Another approach is to employ an adsorbent with the desired adsorption isotherm properties and to process it into an appropriate shape or form without necessarily requiring any special provision for dilution. The improved combination of high working capacity carbons on the fuel source-side and preferred lower working capacity adsorbent on the vent-side provides substantially lower diurnal breathing emissions without a significant loss in working capacity or increase in flow restriction compared with known adsorbents used in canister configurations for automotive emissions control systems.

30 Claims, 3 Drawing Sheets



U.S. PATENT DOCUMENTS

5,456,237 A * 10/1995 Yamazaki et al. 123/519
5,460,136 A * 10/1995 Yamazaki et al. 123/519
5,477,836 A * 12/1995 Hyodo et al. 123/519
5,538,932 A * 7/1996 Yan et al. 502/424
5,564,398 A * 10/1996 Maeda et al. 123/519
5,691,270 A * 11/1997 Miller 502/174
5,736,481 A * 4/1998 Miller 502/174
5,736,485 A * 4/1998 Miller 502/174
5,863,858 A * 1/1999 Miller et al. 502/180
5,914,294 A * 6/1999 Park et al. 501/100
5,914,457 A * 6/1999 Itakura et al. 123/519
6,136,075 A * 10/2000 Bragg et al. 55/519
6,171,373 B1 * 1/2001 Park et al. 95/138
6,279,548 B1 * 8/2001 Reddy 123/519
6,284,705 B1 * 9/2001 Park et al. 502/180
6,488,748 B2 12/2002 Yamafuji et al.

* cited by examiner

FIGURE 1

PRIOR ART

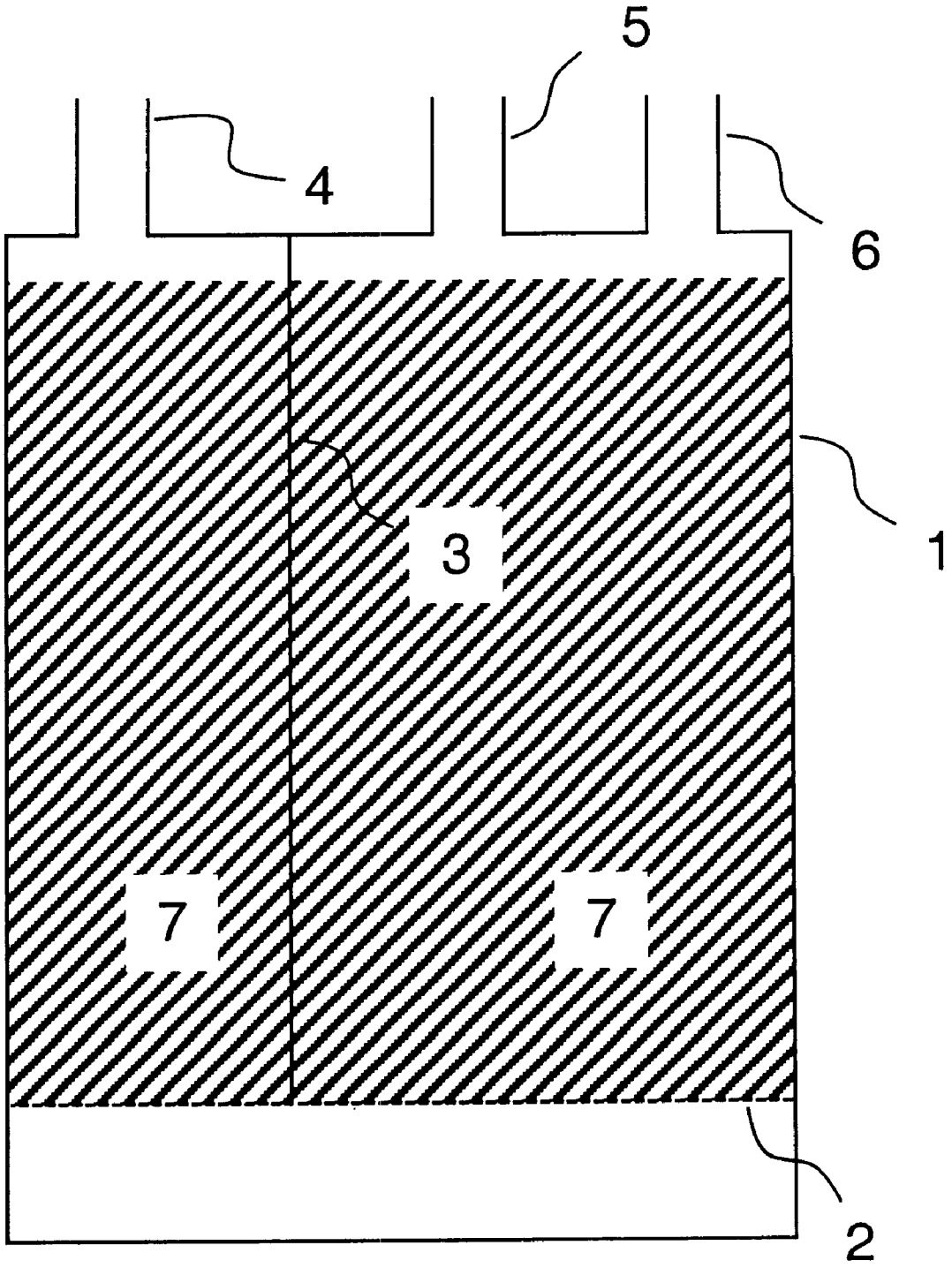


FIGURE 2

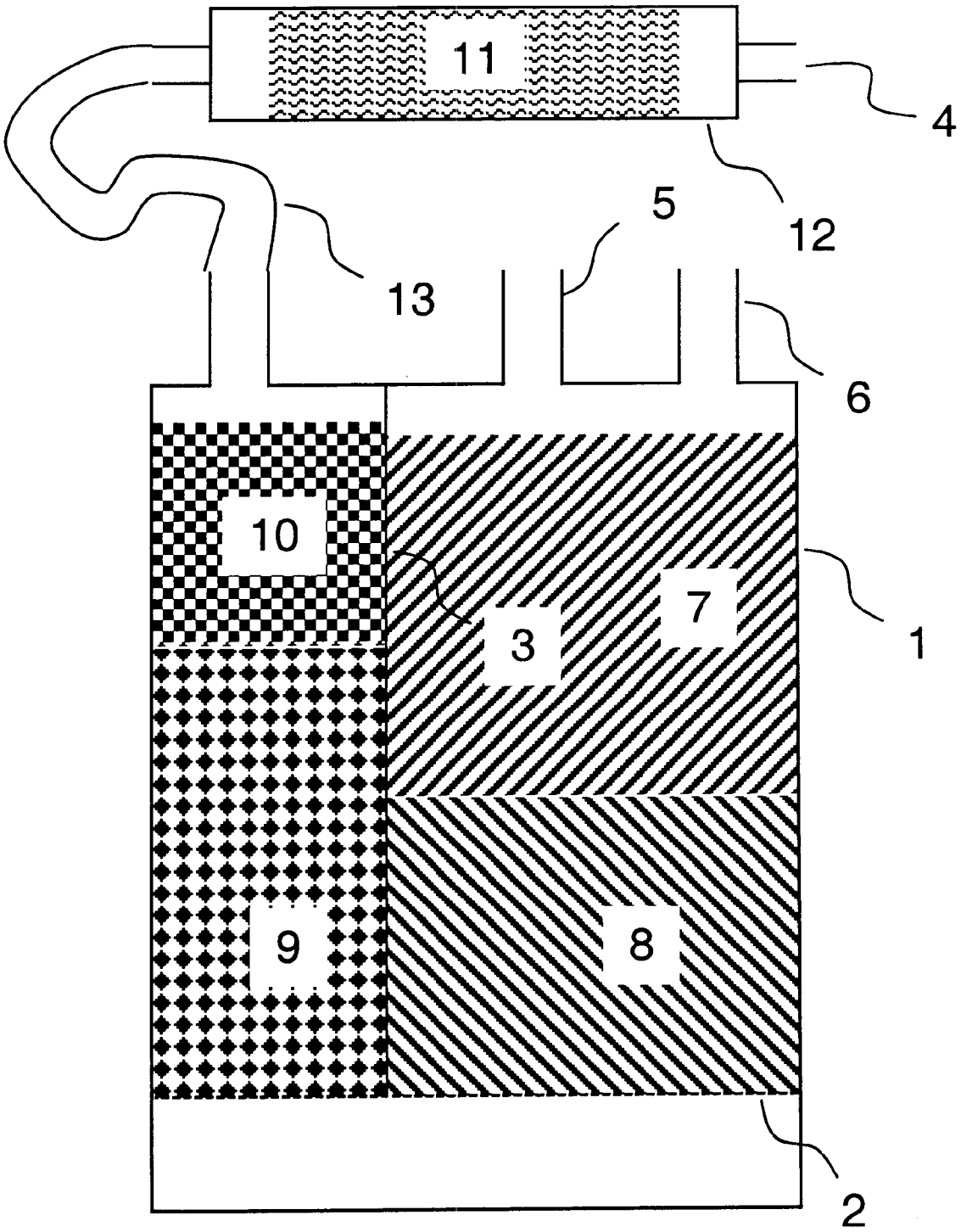
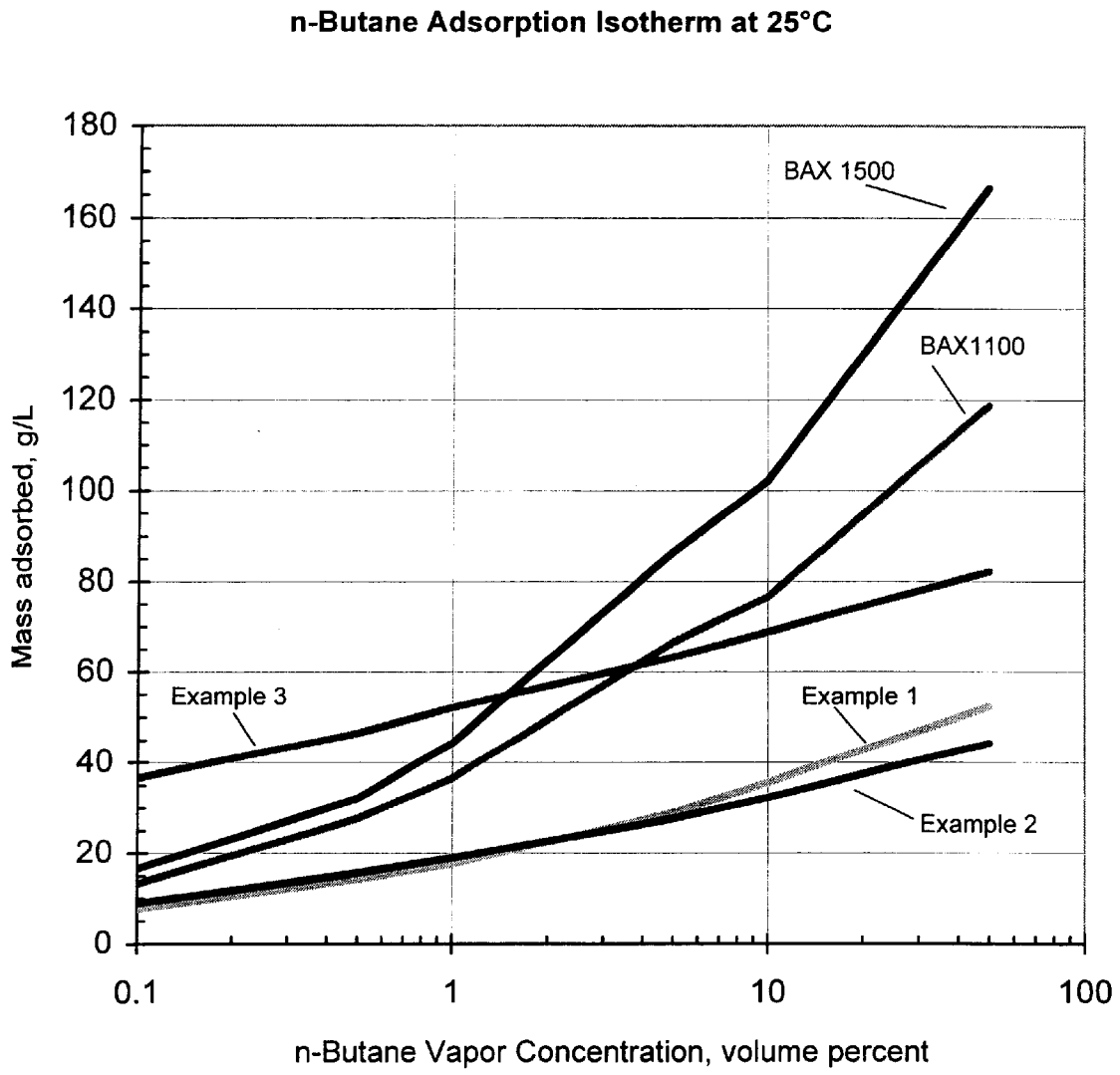


FIGURE 3



DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.