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**Reddy**

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(54) **EVAPORATIVE EMISSION CONTROL  
CANISTER SYSTEM FOR REDUCING  
BREAKTHROUGH EMISSIONS**

5,377,644	*	1/1995	Krohm	123/520
5,456,236	*	10/1995	Wakashiro et al.	123/519
5,482,023	*	1/1996	Hunt et al.	123/520
5,687,697	*	11/1997	Ishikawa et al.	123/520
6,098,601	*	8/2000	Reddy	123/520

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\* cited by examiner

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

(57) **ABSTRACT**

The effectiveness against vapor breakthrough of an adsorbent material (e.g., activated carbon granules) containing canister in an evaporative fuel emission control system is greatly increased by employing a relatively small secondary volume of adsorbent downstream of the vapor vent of the primary adsorbent volume and heating the secondary volume just prior to commencing the flow of purge air back through the two adsorbent volumes to remove adsorbed fuel and carry the purged fuel to the induction system of an associated engine. The secondary volume is heated to a temperature enabling complete purging of hydrocarbons from it and, thus, to greatly increase the capacity of that volume to prevent fuel vapor breakthrough during the subsequent engine-off fuel vapor storage cycle. The secondary volume may be contained in a common canister with the primary volume or in a secondary canister.

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(22) **Filed:** **Dec. 13, 1999**

(51) **Int. Cl.**<sup>7</sup> ..... **F02M 33/04; F02G 5/00**

(52) **U.S. Cl.** ..... **123/520; 123/557; 123/519**

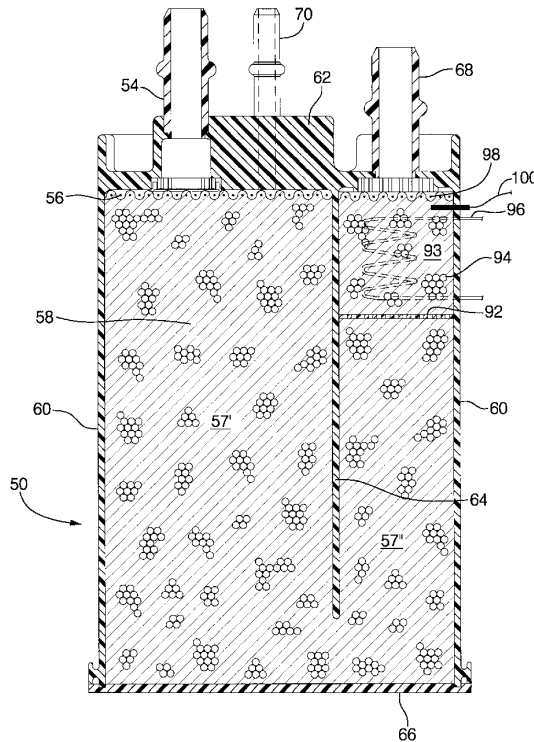
(58) **Field of Search** ..... **123/516, 518,**  
**123/519, 520, 549, 557**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,598,686	7/1986	Lupoli et al.	123/519
4,732,588	3/1988	Covert et al.	55/196
4,778,495	10/1988	Bishop et al.	55/269
4,864,103	9/1989	Bishop et al.	219/375
5,355,861	* 10/1994	Arai	123/519

**14 Claims, 6 Drawing Sheets**



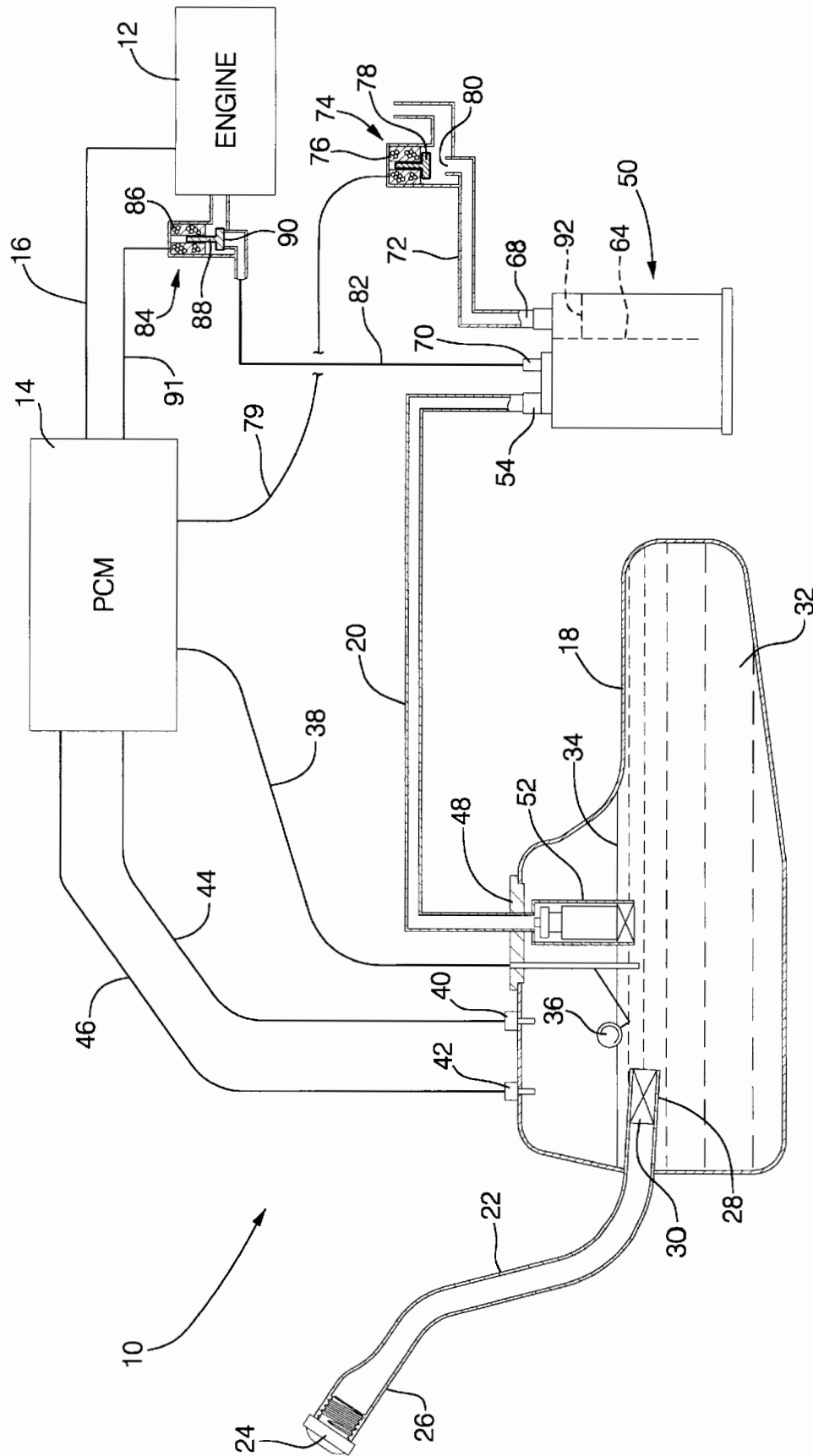


FIG. 1

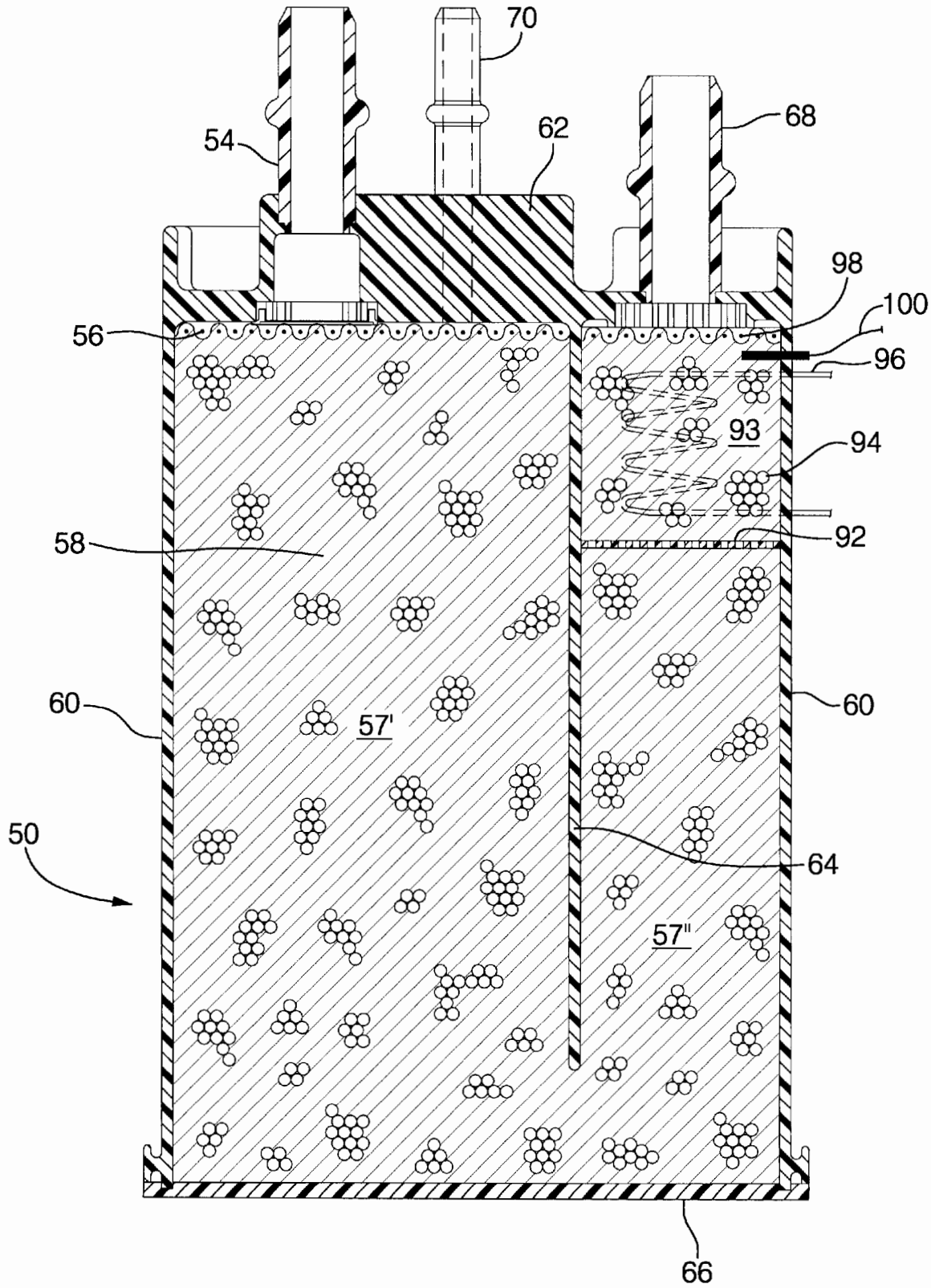


FIG. 2

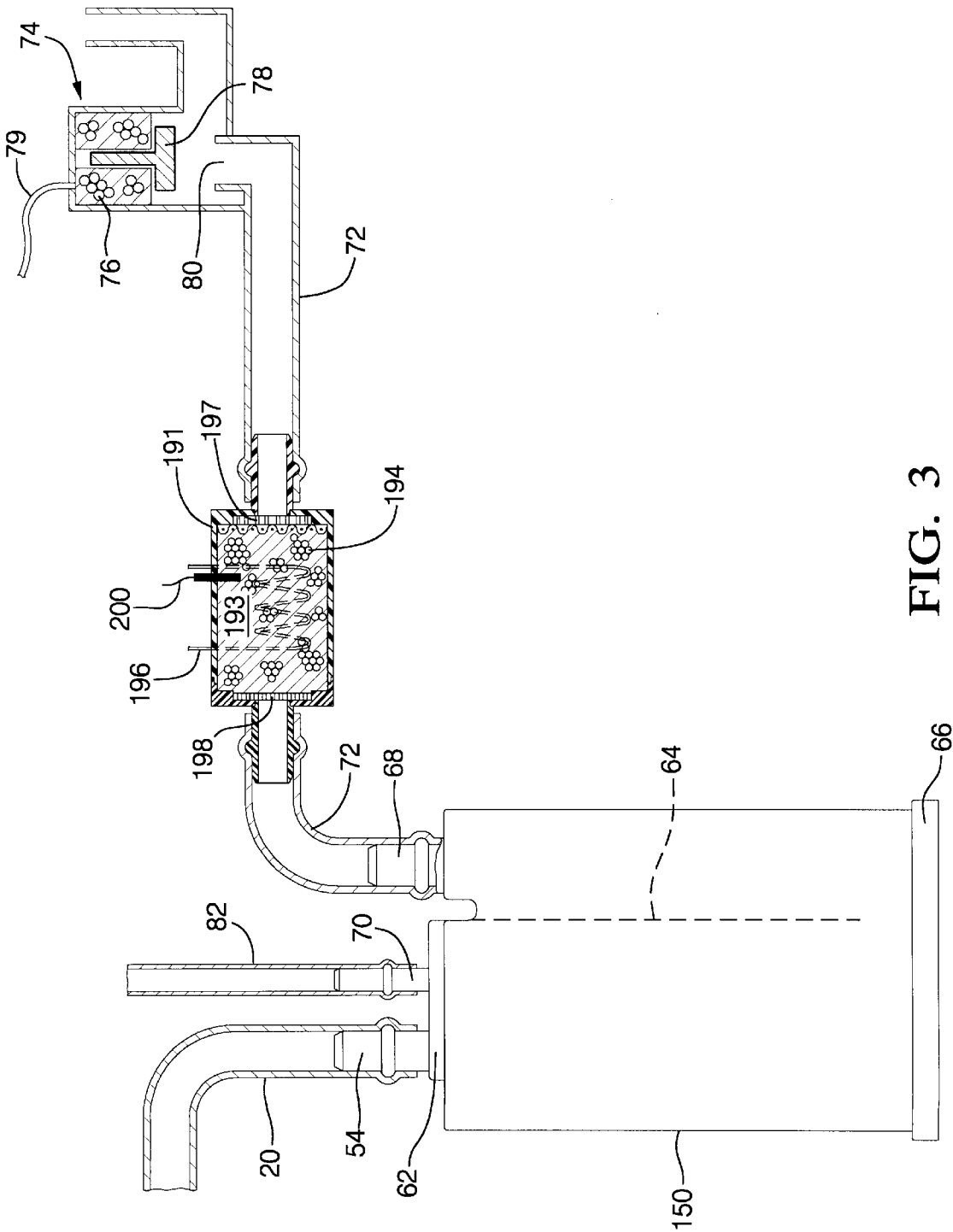


FIG. 3

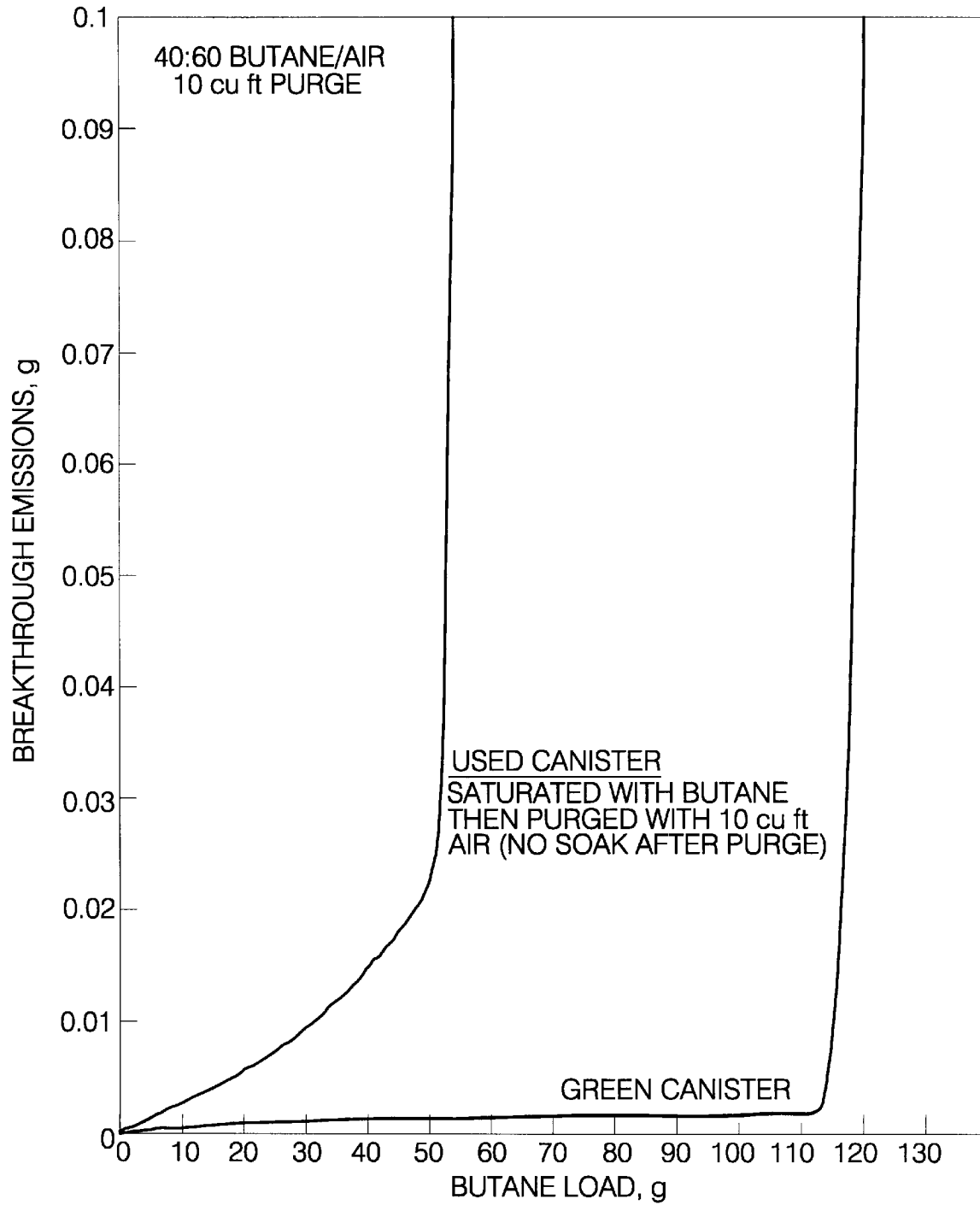


FIG. 4

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