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Severinsky et al.

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(54) **HYBRID VEHICLES**

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(73) Assignees: **PAICE LLC**, Bonita Springs, FL (US); **The Abell Foundation, Inc.**, Baltimore, MD (US), (part ownership interest)

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(65) **Prior Publication Data**

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Related U.S. Application Data

(60) Division of application No. 12/320,600, filed on Jan. 29, 2009, now abandoned, which is a division of application No. 11/459,458, filed on Jul. 24, 2006, now Pat. No. 7,520,353, which is a division of application No. 10/382,577, filed on Mar. 7, 2003, now Pat. No. 7,104,347, which is a division of application No. 09/822,866, filed on Apr. 2, 2001, now Pat. No. 6,544,088, which is a continuation-in-part of application No. 09/264,817, filed on Mar. 9, 1999, now Pat. No. 6,209,672, said application No. 10/382,577 is a continuation-in-part of application No. 09/392,743, filed on Sep. 9, 1999, now Pat. No. 6,338,391.

(60) Provisional application No. 60/100,095, filed on Sep. 14, 1998, provisional application No. 60/122,296, filed on Mar. 1, 1999.

(51) **Int. Cl.**

G05D 3/00	(2006.01)
G05D 1/00	(2006.01)
B60K 6/20	(2007.10)

(52) **U.S. Cl.** **701/22**; 701/84; 180/65.21

(58) **Field of Classification Search** 340/988–996
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,343,970	A *	9/1994	Severinsky	180/65.25
5,483,939	A *	1/1996	Kamura et al.	123/492
5,695,722	A *	12/1997	Myers et al.	422/174
5,806,617	A *	9/1998	Yamaguchi	180/65.235

OTHER PUBLICATIONS

Sutherland, A State Language for the Sequencing in a Hybrid Electric Vehicle, IEEE Trans. Ind. Elec., vol. 1E-30, No. 4, 318-322 (1983).
Somuah, A Microcomputer-Controlled Powertrain for a Hybrid Vehicle, IEEE Trans. Ind. Elec., vol. 1E-30, No. 2, 126-131 (1983).
Bose, A Microcomputer-Based Propulsion Conro System of a Hybrid Electric Vehicle, IEEE Trans. Ind. Elec., vol. 1E-31, No. 1, 61-68 (1983).

* cited by examiner

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Assistant Examiner — Muhammad Shafi
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(57) **ABSTRACT**

A hybrid vehicle comprises an internal combustion engine, a traction motor, a starter motor, and a battery bank, all controlled by a microprocessor in accordance with the vehicle's instantaneous torque demands so that the engine is run only under conditions of high efficiency, typically only when the load is at least equal to 30% of the engine's maximum torque output. In some embodiments, a turbocharger may be provided, activated only when the load exceeds the engine's maximum torque output for an extended period; a two-speed transmission may further be provided, to further broaden the vehicle's load range. A hybrid brake system provides regenerative braking, with mechanical braking available in the event the battery bank is fully charged, in emergencies, or at rest; a control mechanism is provided to control the brake system to provide linear brake feel under varying circumstances.

39 Claims, 17 Drawing Sheets

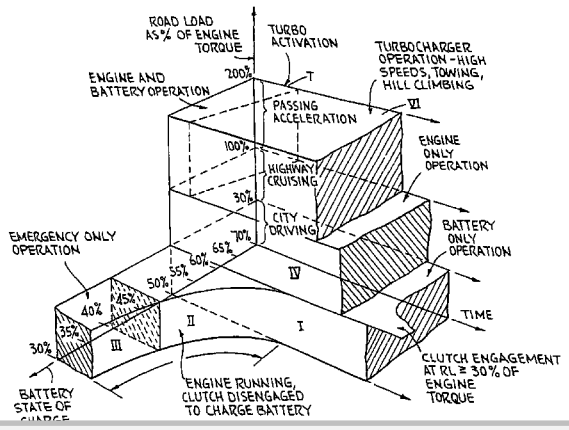


FIG. 1
(PRIOR ART)

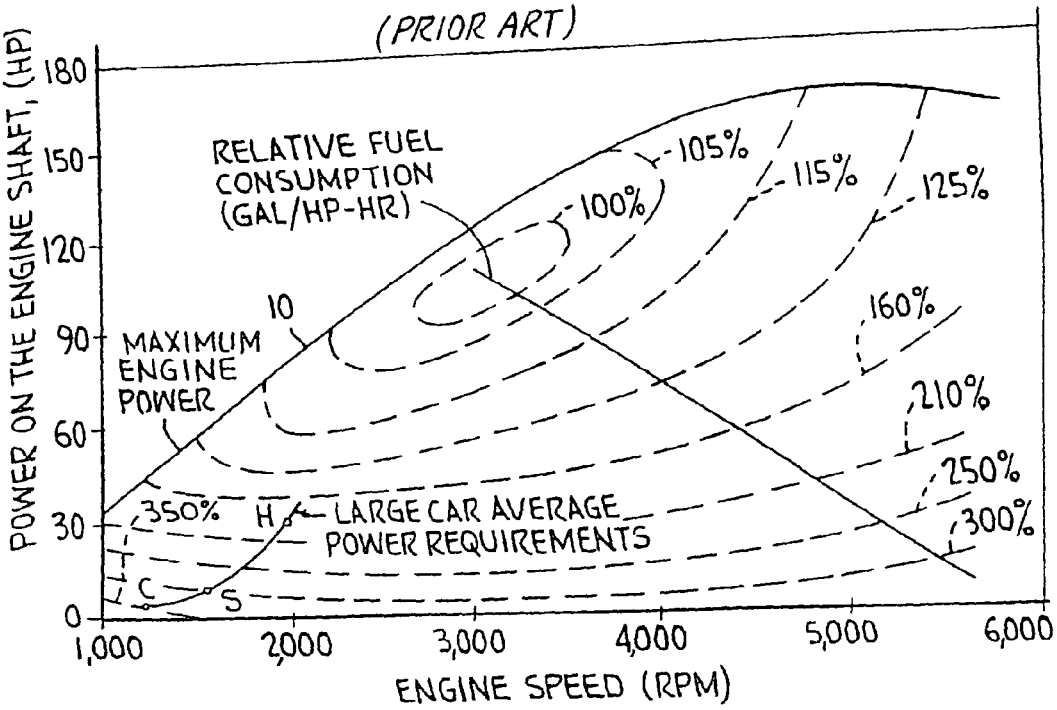
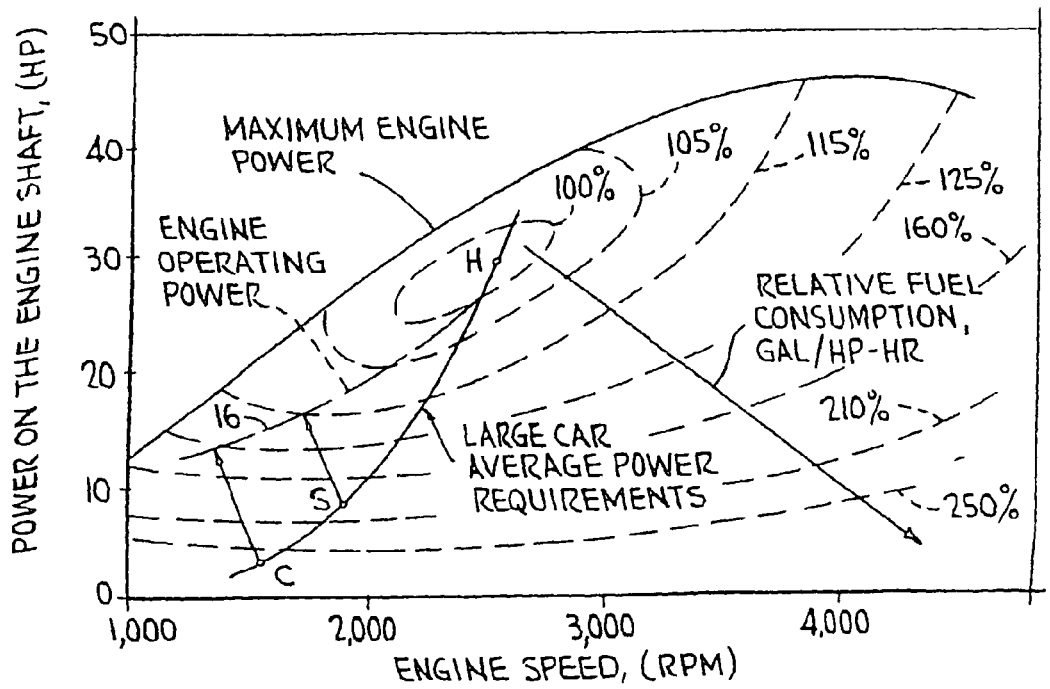


FIG. 2



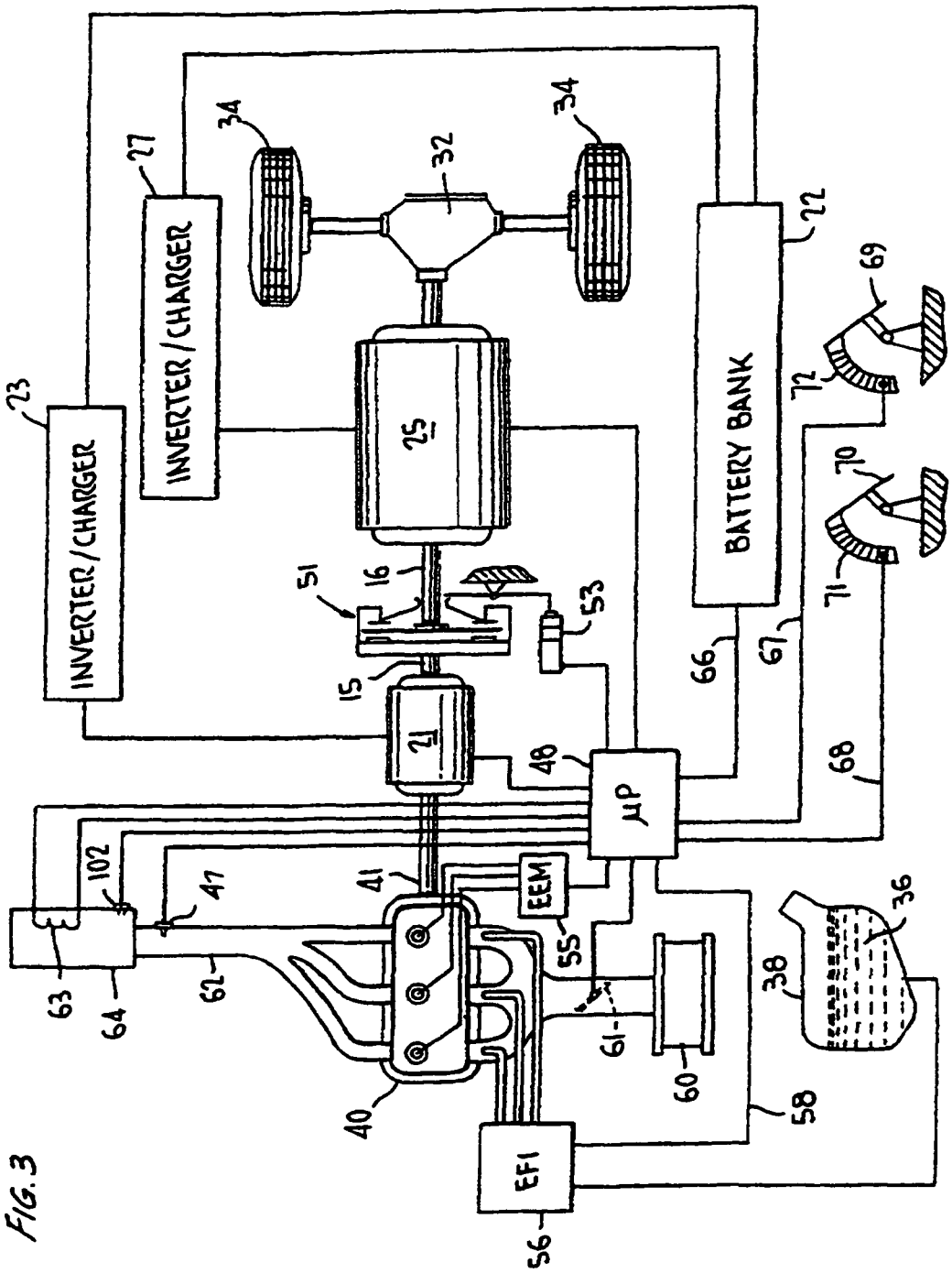


FIG. 3

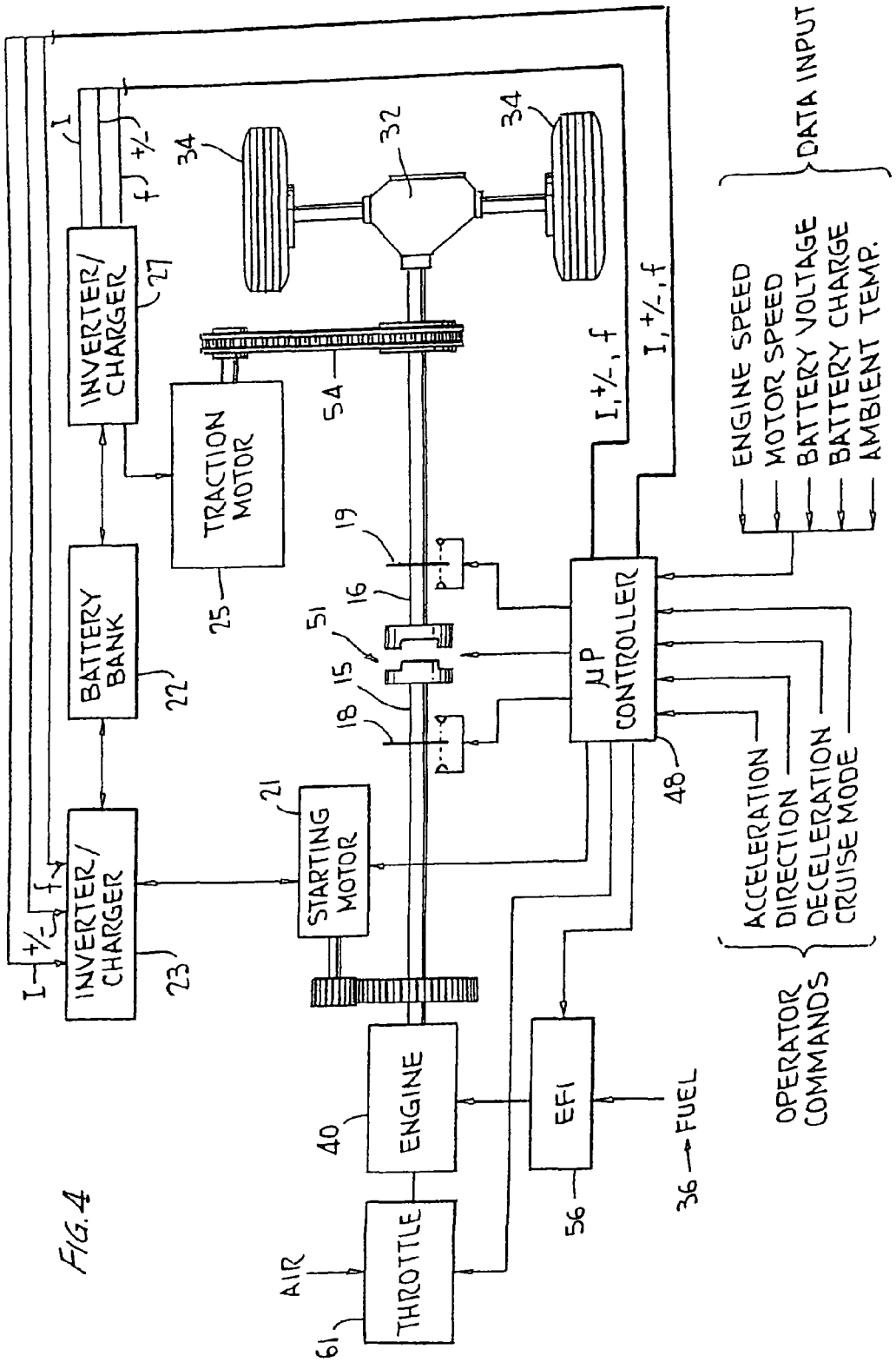


FIG. 4

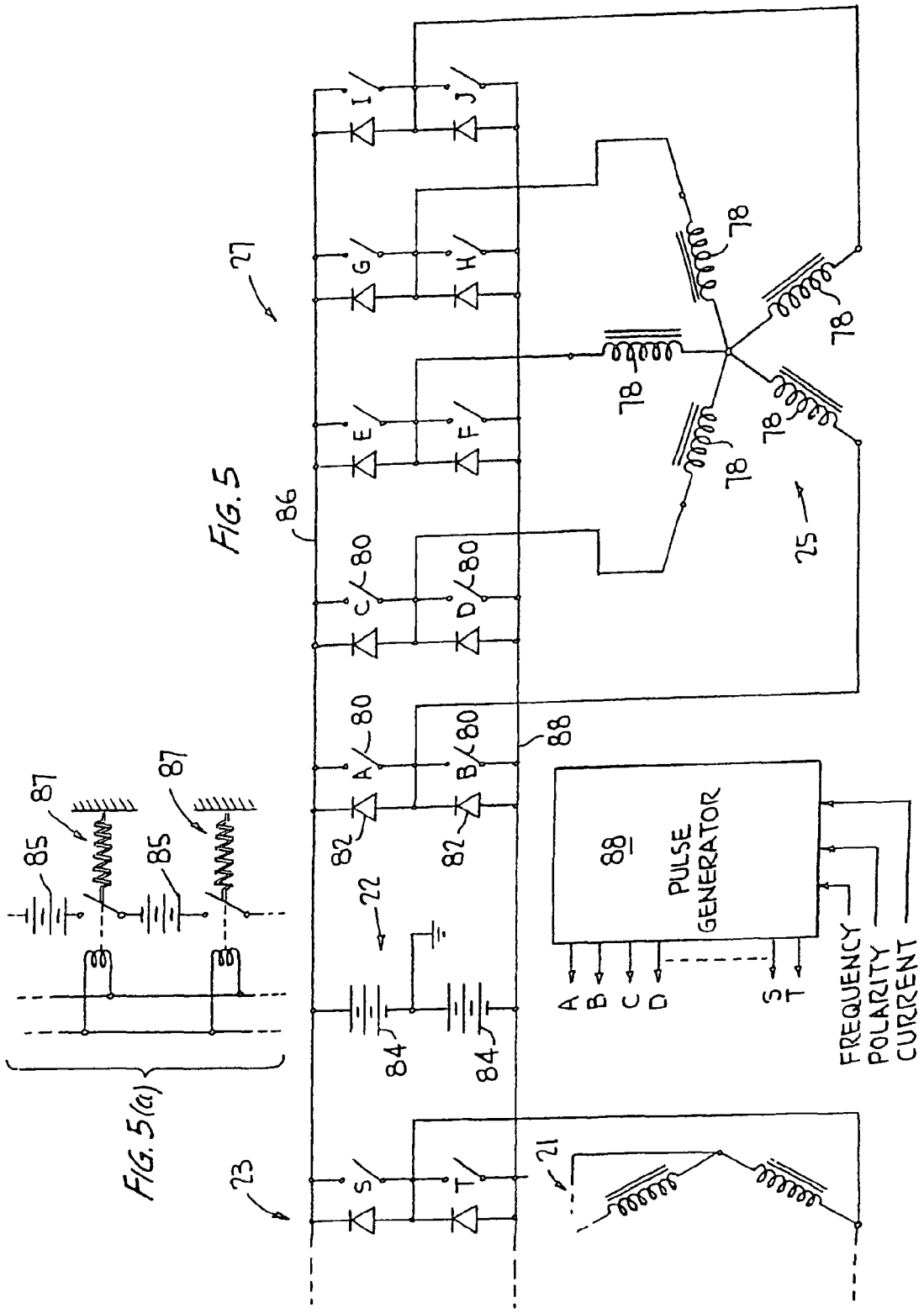


FIG. 5

FIG. 5(a)

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