



Ed Gray Motor Variant -- Open Source Project

Sponsored by Pure Energy Systems

PM/PEM,M-G

Permanent Magnet / Pulsed DC Electromagnet Motor - Generator

Status: Project commenced May 26, 2004. Claim to working OU device by Gary Magratten (not yet rigorously verified). Plans [were] gradually being uploaded here. As of Oct. 18, 2006, see <http://www.coldelectricity.info/>

Warning: high voltage, high current, laser switching

(PES Home)



- [Project Home](#) -
- [PESWiki feature](#) -

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[Gary's Site](#)

[Latest](#)

[email forum](#)
(about)

Prototypes



[Motor #3](#)



[Motor#2](#)



[Motor#1](#)



[Power Supply](#)

G.M. (inventor)

Edwin V. Gray

- [Bio](#) (1925-1989)
- [Patents](#)
 - o [US 3,890,548](#)
 - o [US 4,595,975](#)
- [Hackenberger](#) (technical discussion)
- [Articles](#)
- [Photos](#) (Gray)

Instructions

- [Intro](#)
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Google Search

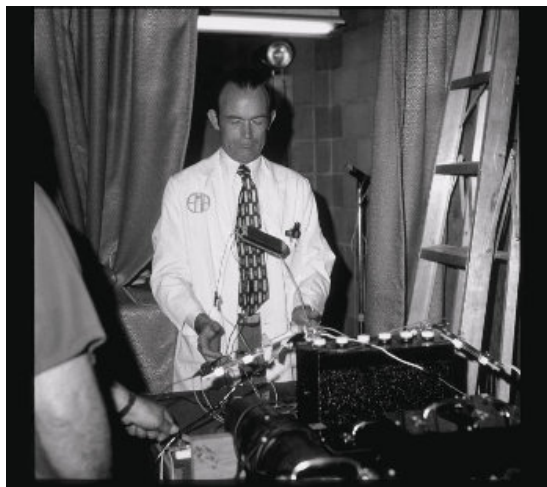
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Technical Discussion: Energy Management Systems

Report by Richard Hackenberger at the time he was Ed Gray's Engineer, regarding the EVGray EMA motor and its circuit input-output measurements, scientific basis for the function, and projected development, explaining avalanche power pulse principles in terms of existing models of physics.

Date unknown (1970's?)

Also available in original formatting view:
[Technical Discussion: Energy Management Systems](#)
(865kb tif file)



Richard Hackenberger demonstrating magnetic repulsion. ([source](#))

Preface

From: [G.M.](#)

To: sterlingda@pureenergysystems.c*

Sent: Friday, May 28, 2004 7:43 AM

Subject: Proper background for project

[excerpt]

Dear Sterling,

[...] Next week I will send you a copy of a very important document. Edwin Gray's business was named EVGRAY. Mr. Gray's electrical engineer was Mr. Richard Hackenberger. Mr. Hackenberger prepared a report entitled "**Technical Discussion**" in which he

- 1) disclosed the test results of the EVGRAY motor as tested at UCLA

- 2) disclosed the exact nature of the operating scientific principles of the motor.
- 3) Provided important flow block diagrams with critical design values for voltage, current and power.

After reviewing the [two patents](#), the Technical Discussion [this page], and the Summary of Loeb and Meek's "[Mechanism of the Electric Spark](#)", it should be very clear to you the significance of this information that I am giving you.

Respectfully,
[G.M.]

- [How it Works](#)
- [Bill of Materials](#)
- [Circuit](#)
- [Assembling](#)
- [Templates](#)
- [Tips](#)
- [Variations](#)
- [Cautions](#)
- [Issues](#)
- [Credits](#)

* * * *

From: [G.M.](#)

To: Sterling D. Allan

Sent: Tuesday, June 01, 2004 3:02 PM

Subject: Technical Discussion, R. Hachenburger

[excerpt]

With the Technical Discussion you have everything you need.

* * * *

From: [G.M.](#)

To: Sterling D. Allan

Sent: Thursday, June 03, 2004 7:23 PM

Subject: ready to go with Eff. Power Supply

[excerpt]

Dear Sterling,

Wonderful! The 'Technical Discussion' contains the essence of Gray's work that was never disclosed in the [patent](#).

With the recreation of the 'Efficient Power Supply', the "Radiant Event" that Dr. Lindemann refers to in his book appears from the high voltage anode.

Dr. Lindemann and I have gone back and forth on the terminology of the Radiant Event and what exactly is going on in terms of physics. Dr. Lindemann is sometimes put off by my use of standard physics; inverse photoelectric effect, avalanche and quantum theory. He is saying that this is a different form of energy. Dr. Lindemann may very well be absolutely correct. The energy does leave the high voltage anode at right angles to the path of the current, much different than the magnetic flux set up by a normal direct current.

The investigation into the nature of this energy is where the real work begins. With the photos of the power supply and the ER on the power supply the magnitude of the discharge can be observed.

Delivering this "Radiant Energy" to the motor electromagnets is where Gray was able to achieve the results recorded in the test data in the Technical Discussion.

My explanation of the physics of the radiant event that I observed is speculation. The radiant event has been confirmed, the exact nature of this energy is the question. Perhaps your father may be of some help on this one, once the experimental apparatus is set up and the general theory is discussed.

This is real over-unity.

— [G.M.](#)

Transcription

OCR Scan & Transcription by [Sterling D. Allan](#) June 3,4 2004

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TECHNICAL DISCUSSION

ENERGY MANAGEMENT SYSTEMS

GENERAL

For many years the Electro Magnetic Energy Storage System has been used exclusively in the development of kinetic energy from electrical energy. The primary reason for this is dictated by the fact that the magnetic energy that can be stored with a ferro electric field and therefore, the force readily producible by an electro magnet field, is 104th times greater than that conveniently possible with an electro static field.

Losses associated with such systems, due to electrical resistance, gap losses, windage, and other mechanical resistance; are manifested as heat which can not be recovered either as electrical or kinetic energy. Examination of the purely electro-static forces available, were they readily adaptable for use in practical systems, indicate a superior energy transformation from electrical to kinetic energy would be possible.

In the Energy Management System concept, both the electromagnetic and electrostatic power available is utilized in the conversion from electrical to kinetic energy. This system reduces to an absolute minimum the thermal energy loss. In addition, the Energy Management System offers a means whereby part of the electrical energy involved in producing kinetic energy is being reclaimed electrochemically in all battery operated systems. This design has been Incorporated in the EMS-4 motor by EVGRAY ENTERPRISES INC. With the construction of each of the prototypes, more is learned and design improvements are made.

The latest motor currently under construction will maintain an extremely high efficiency. Such ENERGY

Replications

Performance Data

Supplemental

- [Strategies/Goals](#)
- [Store](#)
- [Sourcing](#)

Theory (How)

- [e-Avalanche](#)

Legal

- [Nonencumbrance](#)

FAQ

Related Sites

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DESIGN APPROACH

An efficiently designed synchronous A.C. electric motor rated at 10 kw or more, (10 H.P. and above) is 93% to 96% efficient in the conversion of A.C. electrical power into kinetic energy. Such efficiency figures are appealing to the designer of battery operated electric motor devices. However the battery output energy must be inverted to A.C.. The total system efficiency therefore is that of a synchronous motor, less the efficiency of the inverter. Using a standard approach to such a system would result in an overall system efficiency of between 70% and 80%.

A standard well designed brush type D.C. traction motor is capable of this same efficiency, therefore synchronous motors are rarely used in battery operated power systems.

Most A.C. motors currently available operate on 60 Hz (cycles) A.C. line power at voltages from 115 to 230 V.A.C. Special high frequency motors are also available which operate at higher speeds from power converters (changes of 60 cycle A.C. to 1000 cycle A.C.). Such motors where a two pole magnetic system is employed, operate at 60,000 R.P.M. as compared to 3600 R.P.M. for a 60 cycle motor.

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These high frequency motors use field windings containing fewer turns of wire for a given power rating, than used in 60 cycle motors with the same rating. This is due to the increased reactance (resistance) to alternating current-flow at higher frequencies. Since power turns are used, the D.C. resistance of the high frequency motor fields is substantially reduced. If such a motor could be designed to operate directly from D.C. power an apparent improvement in efficiency is suggested.

If we convert an A.C. motor to a D.C. power source, it will not operate. Only heat is developed. This is due to the lack of commutation (means for developing a rotating magnetic force). In standard D motors, a brush contact commutator is used to cause the motor armature to rotate.

THE EMS PRINCIPLE

The challenge was to design a highly efficient motor which will operate from D.C. without using a brush contact commutator to achieve an efficiency equal to or in excess of that realized in the A.C. synchronous motor may be obtained.

1. OPERATING VOLTAGE. Instead of using 115 volts or 230 volts, if we use 2000 or 3000 volts, whatever D.C. resistance the motor field winding may have, becomes negligible. Little or no heat is generated.

2. PULSE OPERATION. Instead of using A.C. or D.C. from the batteries directly we use pulses of D.C. at 2000 to 3000 volts which will further improve the motor efficiency due to (a) use of both electromagnetic and electrostatic energy in the motor field windings. (the electrostatic field strength being increased as well as the electromagnetic field strength in a high voltage system).

(b) Elimination of the brush contact commutator. Pulse operation is provided by a spark gap commutator or a solid state pulse commutator.

The Energy Management System motor (E.M.S.) incorporates these principles in a unique way.

Both the stator (stationary) field windings and rotor (rotating) field windings are low resistance.

During the charge of the magnets, also when the magnetic field is collapsed and if the capacitor bank is overcharged, a 60 - 120 amp D.C. pulse is directed back to the battery pack directly to provide a recycling of the electro chemical energy

THE E.M.S. MOTOR FUNCTION

In the E.M.S. motor, Evgray Enterprises incorporates the use of high energy narrow pulses of D.C. energy to provide a continuously revolving field due to distribution through a special pulse operated commutating system.

Both the stator fields and the rotor fields are subjected to these bursts of pulse energy in sequence to cause rotation of the motor shaft.

The motor development introduces a new phenomenon associated with the use of ionized atmosphere wherein chemical dissociation of the atoms and production

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of **avalanche**, electronically derived, kinetic energy is combined with the electrostatic and electromagnetic force fields to develop exceptionally high torque with modest power input requirements. In addition, the collapsing

electrostatic fields stored in the motor poles produce high current-electrical power pulses which may be utilized to restore electro-chemical power to the battery pack.

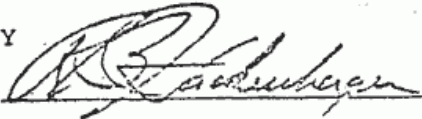
EMA-MOTOR SPECIFICATION

(All performance data should be corrected to sea level or test conditions noted)

Weight — Bare	300 lbs.
Weight Including battery and ancillary equipment	400 lbs.
Maximum Power. — Continuous	50-100 HP depending upon battery consumption
Maximum Torque — Continuous	240-480 ft. lbs.
Power/Speed Curve (with and without speed control)	To be determined
Torque/Speed Curve (with and without speed control)	To be determined
Efficiency/Power Curve (at constant and varying speed)	To be determined
Temperatures	60°C to +150°C
Humidity	20% to 100% RH
Pressure	10 to 0.2 atmospheres
Volume	16" dia. x 45" max.
Battery Current Time Curve	To be determined
Energy balance summary of the engine	To be determined
Design Speed	0 RPM to 5,000
Acceleration	0 to 5000 RPM under full load in less than 5 seconds
Speed variation and stability at constant speed	2%
Normal Power	25H.P.
Maximum Power	100 H.P.
Buttery Voltage	12 Volts
Battery Capacity	434 Amp. Hours

EVGRAY ENTERPRISES, INC.

BY



EVGRAY ENTERPRISES, INC.

BY [RB Hackenberger signature]

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The EMA motor differs from conventional DC motors in several respects:

1. The batteries do not directly drive the motor but rather the high voltage generation circuitry.
2. The EMA is a high voltage motor, i.g., 3000 volts.
3. The motor is electro-statically driven which is unique.
4. The motor is response to a high rate of high voltage/low amp power pulse (80-100K/Min).
5. Due to the design architecture the motor has the ability to restore/recycle the electro-chemical energy to the battery pack thereby permitting motor operation over extended periods of time. This will be subsequently explained but it should be noted here that no laws of physics regarding energy are violated.
6. In addition to the recycling noted above, we don't have the chicken and the egg problem with generators on DC motors. The EMA motor uses a standard 30 amp generator and the energy output is less than the kinetic energy required to drive it.

The EMA motor works by electro-magnetic association. It takes very little energy to activate the EMA motor which in turn produces a great deal of electrical power. This power is harnessed by directing the current flow to electro-magnets which in turn causes a magnetic attraction and repulsion sequence which turns the motor rotor. During motor operation, power from the high voltage section is put through a system of electrical circuitry to produce a series of power pulses. The pulses are transferred to a small control unit, which in turn operates the major motor unit. The

The shifting position and polarity of the spikes between electromagnets are located on both the rotor and stator of the large motor. Attraction and repulsion between the two sets of magnets sets the motor/generator in motion. Once in motion, the motor/generator recharges the batteries with 60- 120 amp pulses, as a result of the recycle/generation system, and also provides the electrical power required for work to be accomplished. To prevent condensation in the main cylinder and to dissipate a high voltage corona, a 1/2 pound of air pressure has to be maintained. **Figure 1** depicts the energy flow in the EMA.



Figure 1: EMS Block Diagram

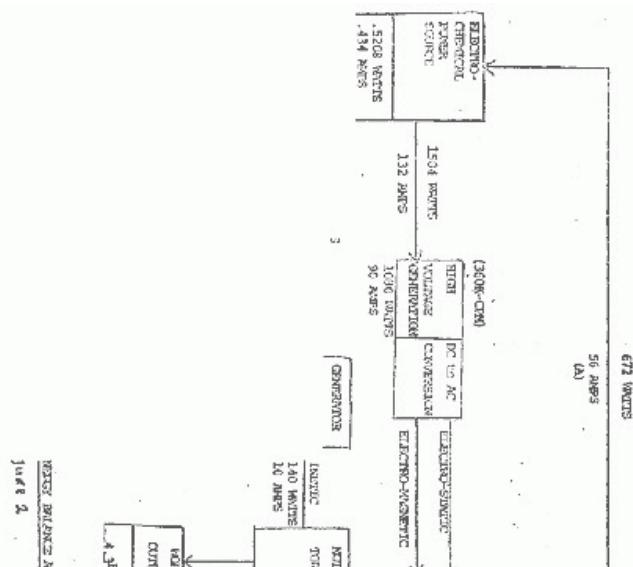
The idea of a recycling electric motor, at first appears to go against much of the theory of electricity and the conservation of energy. The EMA motor/generator does not, however, violate the basic laws of physics, but rather, utilizes them in a unique

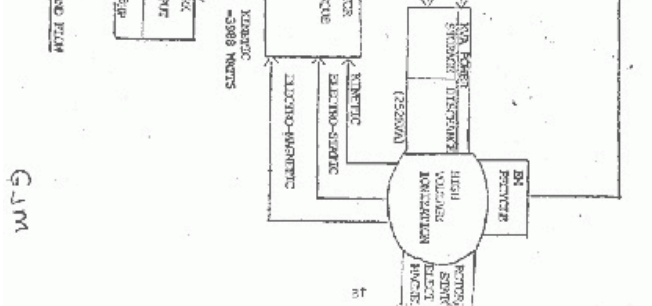
integration in a system, in order to maximize upon the characteristics and interrelationships between electrical, magnetic, and physical components.

The EVGRAY EMA motor development introduces new phenomena associated with the use of ionized atmosphere wherein chemical disassociation of the atoms and production of avalanche electronically derived kinetic energy is combined with the electrostatic and electromagnetic force fields to develop exceptionally high torque with modest power input requirements. In addition, the collapsing electro-static fields stored in the motor poles produce high current-electrical power pulses which may be utilized to restore electro-chemical power to the battery pack. These pulses are of sufficient magnitude to cause physical damage to standard battery cells. The battery must therefore be extremely rugged to accommodate this synchronous recharge cycle during battery operation.

The development of practical power systems dictates research in the area of battery life. While 90% recapture of the electro-chemical battery power is theoretically possible, it is necessary to limit the recycling of energy to less than 90% to insure adequate battery life.. At the present time are using a recycling rate of 43%, and the generator provides approximately 25%.

Figure 2 depicts the energy balance and flow measurements in a recent test.





[click for enlargement](#)

Figure 2: EMA-4 Energy Balance and Flow

To date we have produced 4 operational EMA motors E2 motors incorporating the recycling principle and have validated the technical principles involved. EMA-4 has over 1500 operating hours on it. We are presently starting our 5th prototype which is intended to be a 100 BHP automobile engine. Table 1 shows the design specification.

We have planned an 18 month development program (12 months devoted to road, environmental and life tests) for this motor. It will have, a 300 mile range on a continuous run and a 500 mile range on an average driving basis before an external battery recharge is required. We also will be exploring further the following phenomenon:

1. Kinetic energy developed in pole repulsion due to ionization of atmosphere in the motor. An ionized gas may carry two conduction currents; one due to the motion of electrons to the positive electrode, and the other due to the motion of positive ions toward the negative electrode. The effect of the positive ions on the forces action between the free electrons is such as to overcome the electronic forces (the space charge) and hence to allow a much greater current of electrons to flow than would occur in a vacuum. In addition, the positive ions attracted toward the negative electrode form an ionic sheath close to the electrode surface and there set up a high electric field which acts in extracting electrons from the electrode, which adds further to the magnitude of the electric current.

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2. Kinetic force of the electro-static field
3. Kinetic forces due to chemical dis-association of O_2 atoms and CO , O_2 recombination again during the force field.
4. Whether or not we are consuming any part of the ionized atmosphere as a fuel.

As you may note from the above are attempting to determine exactly why we do get the energy recycling when the motor runs. (In fact at idle speeds, with no load on the motor, you can recharge the batteries completely over a 4 hour period.)

With respect to efficiency we get ridiculous numbers, from an engineering view point, when we relate work output to electro-chemical input, e.g. 173%. We are aware that that is not a real number as it doesn't take into consideration the electrically derived kinetic energy, electrostatic forces, and the electro-magnetic wave front, all of which play a part in the energy recycling. A real number is system efficiency in utilization of the electro-chemical energy which amounts to 99.7%.

Table 2 is an independent engineering evaluation of the EL motor, performed by Crosby Research Institute. Some of the design objectives in the planned automotive motor development are as follows:

- Component interchangeability without the need to readjust
- Use of standard off-the-shelf components
- Design to achieve multi-sourcing of components
- Use of standard interchangeable parts
- Use of standard materials and components
- Modular design
- Modular integration
- Modular plug-in components and parts without need to readjust
- Modular system architecture
- Modular integration - basic motors pre-wiring and connections for most common options, input/output controls, and energy storage expansion
- Special attention to:
 - Industrial design
 - Quality Control
 - Assurance
 - Maintainability
 - Documentation
- Use of a standard quality components and materials.

With respect to maintainability and reliability, it is expected that the motors will be maintained by the end-user, therefore, the machine will be designed to reduce servicing cost in conjunction with the following maintenance philosophy:

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- Simple, efficient, diagnostics incorporated within the system, or by use of relatively inexpensive ancillary test equipment (voltmeters, etc.) by unskilled personnel.
- Repairs will be performed by replacement of the faulty part: by spare parts (which will be repaired in service centers). Estimated mean-time-to-repair (MTTR) for a worst case condition is 30 minutes, with 15 minutes being the average.

I don't mean to burden you with all of our plans, etc., but I thought it best to show that while we have something that is real, there is still a lot of engineering required in order to develop a practical automotive motor that could serve as a replacement for an internal combustion engine and not have the present constraints that existing electric automotive motors have with respect to battery recharging and vehicle performance. I would judge that from a technology status we are a little bit ahead, engineering wise, than JPL is with their Hydrogen conversion motor. We know that we can produce a practical automotive motor based upon what we've learned from our existing prototype, but there are still some uncertainties that have to be resolved before there is a marketable product, i.e. manufacturing costs (design goals are \$300), the impact on the vehicle and whether or not any vehicle engineering would be required.

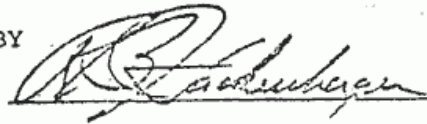
I'm sorry that I don't have more information to give you at this time but we do have a proprietary position to protect. We are a public corporation in California with approximately 600 shareholders and have invested better than \$800,000 in engineering and development in the past 3 years. I might note then 2 years ago we did apply for a research grant from the DPA office of Air and Water programs in Michigan but we were turned down for having a polluting motor. (i.e. when the batteries are recharged they cause a drain on the local power company, and generating plants are notorious polluters, therefore we had a polluting motor with our 4 batteries.) The only emission from the motor is the high voltage corona, or ozones. In addition, the motor does extract moisture from the air during operation.

I hope that all of this makes sense, because we do understand the credibility problem, for an outsider when one considers physics principles. From an engineering viewpoint we are assured that we are not violating any physical laws even though we don't have all of the answers yet. By continuing to use standard engineering methodology we are continuing to learn more each day.

Thank you for your interest in our company.

EVGRAY ENTERPRISES, INC.

BY



EVGRAY ENTERPRISES, INC.

BY [RB Hackenberger signature]

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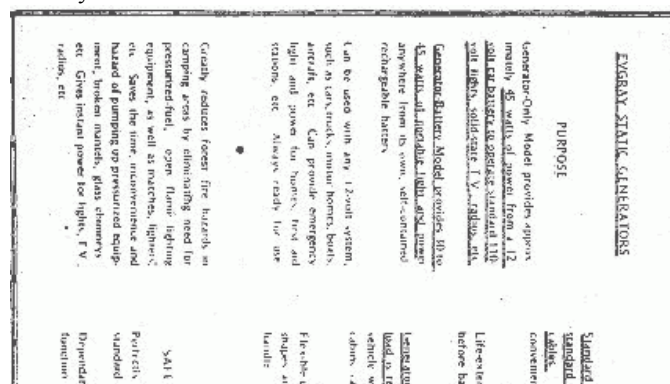
Figure 1, [above](#)

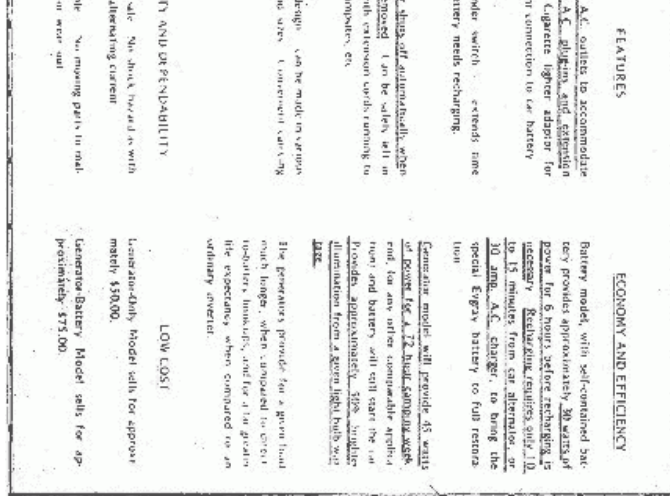
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Figure 2 [above](#)

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EVGray Static Generators -- Brochure





[click for enlargement of brochure](#)

END OF TRANSCRIPTION

See also

- [Edwin Gray Patents](#)
 - [US Patent 3,890,548](#) Edwin Gray "Pulsed Capacitor Discharge Electric Engine"
 - [US Patent 4,595,975](#) Edwin Gray "Efficient Power Supply Suitable for Inductive Loads"
- **Reprints >** (received by Express mail from G.M.)
 - [Technical Discussion: Energy Management Systems](#) (865kb tif file) the above report in image format.
 - [The Engine that Runs Itself](#) (697kb tif file) - 1973 Article in *Probe the Unknown*: "An unconventional approach to harnessing energy has created a motor that requires no fuel and produces no waste. Its inventors say it is the answer to man's transportation and power power problems.
 - [First No-Fuel Car!](#) (172kb tif file) - "Merging an electromagnetic motor with an all-plastic body and chassis, two pioneering inventors will put the first fuelless automobile into production and on sale this year." (*The National Tattler*, Jan. 27, 1974)

Page transcribed and posted by [Sterling D. Allan](#), June 3, 4, 2004
Last updated June 04, 2004



ADVISORY: With any technology, you take a high risk to invest significant time or money unless (1) independent testing has thoroughly corroborated the technology, (2) the group involved has intellectual rights to the technology, and (3) the group has the ability to make a success of the endeavor.



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