F V E A A NEWSLETTER

February 1985

MEETING NOTICE The next meeting will be held on Friday February 15th 1985 at Mid America Federal Savings - 250 E. Roosevelt Rd. Wheaton, Ill. Time - 7:30 P.M.

MEMBERSHIP DUES Membership dues are past due. This may be your last newsletter ! On the reverse side is a renewal form along with the treasurers address.

LETTER FROM THE PRESIDENT

At this month's meeeting we will hear the long-awaited explanation of Joe Pollard's new invention. A brief discussion along with a drawing are included in this newsletter. Also we will be entertained with a talk by George Zarins about his progress in developing an a.c. controller for his Porsche.

Your board of directors has decided to kick off our fund raising effort by manning a booth at a hamfest probably this coming June. Each member will be asked to donate or solicit items to be sold. You must have something you would just love to get rid of (or perhaps your wife could suggest something).

Please start bringing items to the next few meetings so we can have some idea of the magnitude of our endeavor.

Sincerely,

Dana Mock

FVEAA
fox valley electric auto association inc.
624 Pershing St. Wheaton, Ill. 60187

FIRST CLASS

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Rev. Dec. 1984

FVEAA

fox valley electric auto association inc.

MEMBERSHIP

A membership in the Fox Valley Electric Auto Association (FVEAA) is open to everyone. Currently there is only one grade of membership regardless of the members degree of participation in association activities. Membership in the FVEAA is contingent upon payment of the annual membership fee. The membership fee can only be waived by special vote of the Board of Directors. Each member in the FVEAA receives a copy of the FVEAA Newsletter each month. They are also entitled to attend and vote at all association meetings.

All memberships in the FVEAA run from November 1 to October 31 of the following year. The dues are $15.00 per year payable at the November meeting. New members joining after November shall pay $1.25 for each month remaining before the following November.

The following form may be used to apply for membership or to renew one.

Date _____

APPLICATION FOR MEMBERSHIP OR RENEWAL

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

☐ Just interested in Electric Vehicles
☐ I have an Electric Car
☐ I wish to build an Electric Car

Amount enclosed $ _____ for _____ months.

Make checks payable to : FOX VALLEY E A A.

Mail to : Mr. Vladimir Vana, FVEAA Tres.
5558 Franklin
LaGrange, Ill. 60525

3

HYBRIDS

Please refer to drawings on other side.

The first, (upper left) is called a parallel drive. Energy for propulsion comes from two sources. Each source, battery or fuel, is under seperate control and may be used in any proportion desired. The electric motor (M) is usually used to start the vehicle, then the fuel powered unit is used to maintain highway speeds and recharge the battery.

The second circuit (upper right) is commonly called a series drive, only because no one has come up with a better name for it. How about you? You can see the motor is driven from the batteries (B) or the generator (G). When slowing or stopped, the generator recharges the battery. This circuit is similar to a Diesel electric locomotive which uses a prime source to generate electric power.

The third curcuit (center) is a true series drive. It evolved from disscusions we had on testing drives. Notice that high amperage/high power solid state devices are not required. Control is obtained by varying the fields of the generator and motor. Both of these are best if shunt wound. Also the speed of the prime mover may be varied as a control means.

The fourth circuit (bottom) is a recent invention of Calif. Clarence Ellers. It is similar to the first circuit but is marked by having each energy source and drive coupled thru separate clutches, gear boxes and axles. Ellers recommends computer control to adjust the speed of each drive. Could use separate motors (electric) on each front wheel.

No's 3 & 4 are best for regeneration, and electric braking.
No's 1, 2 & 4 are most easily used as electric only (in town).
No 3 can have solenoids shifting the circuit to get the combination of No. 2. Also drive from the prime mover at only highway speeds.

Joseph W. Pollard Feb. 2, 1985

Better battery

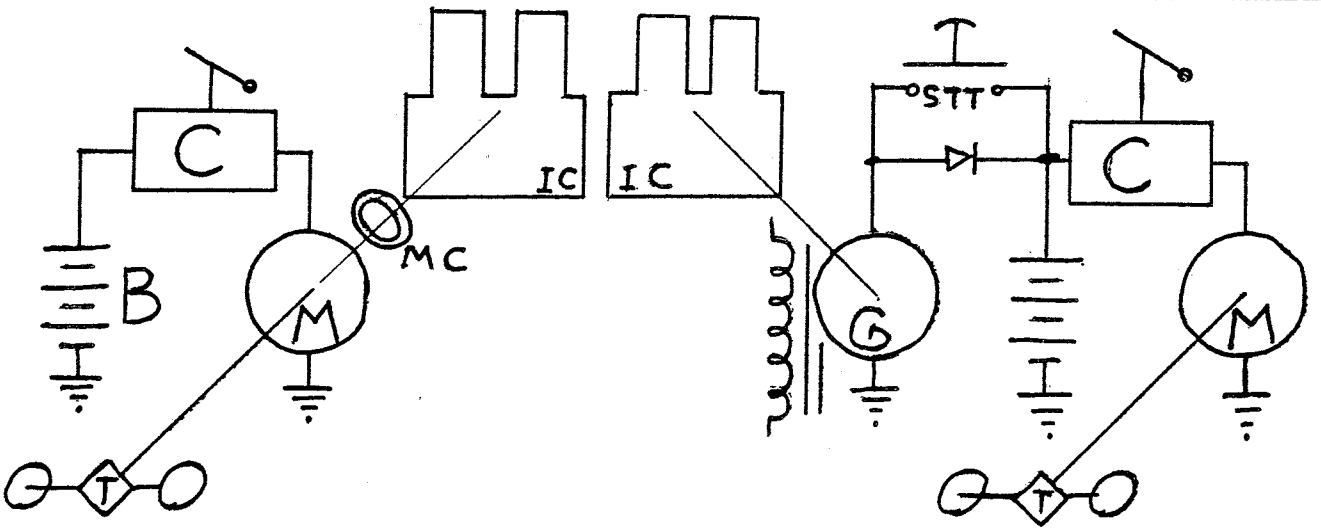
Why haven't electric cars become popular? Because it's impossible to pack enough energy into a light, compact set of batteries. A lot of research over the years has been aimed at solving that problem [PS, Feb. '79; April '81; Feb. '82].

Now, a step in the right direction. The Peugeot 205 Electric is demonstrating remarkable performance in the streets of Paris. The secret: a nickel-iron battery of the type E. F. Lindsley described in his February 1979 piece.

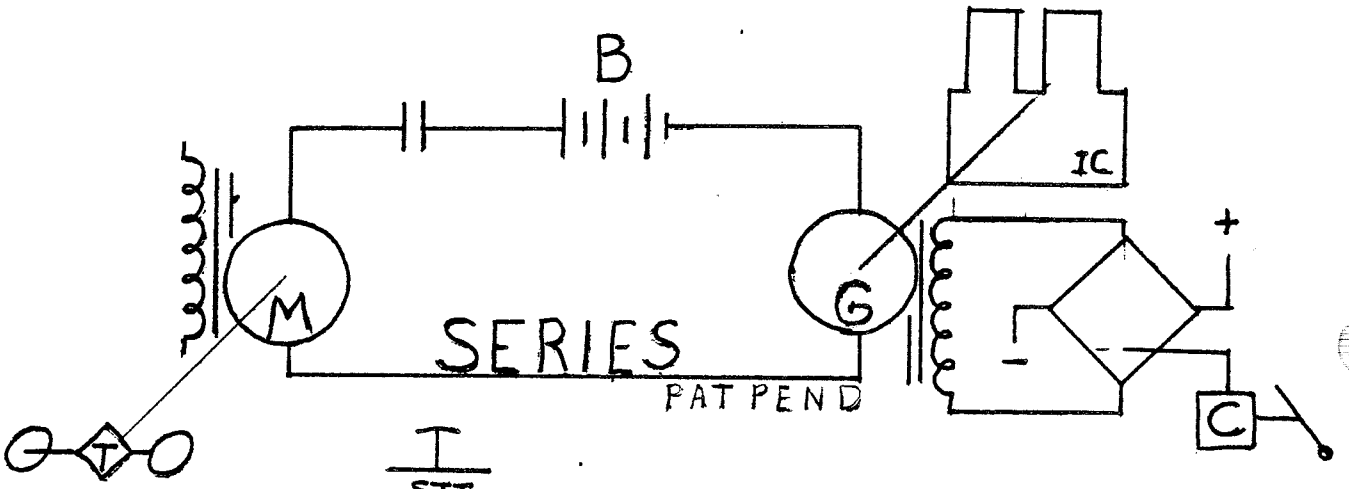
The new device stores about twice as much energy per pound as a regular lead-acid battery. This gives the Peugeot a top speed of more than 60 mph and a city range of 100 miles. All batteries are under the hood, so the car has a trunk for luggage. That's unlike most other electrics, which have hood *and* trunk space crammed with batteries. Finally, the nickel-iron batteries have a life expectancy of 125,000 miles and at least 1,500 recharge cycles—several times the performance provided by conventional batteries.

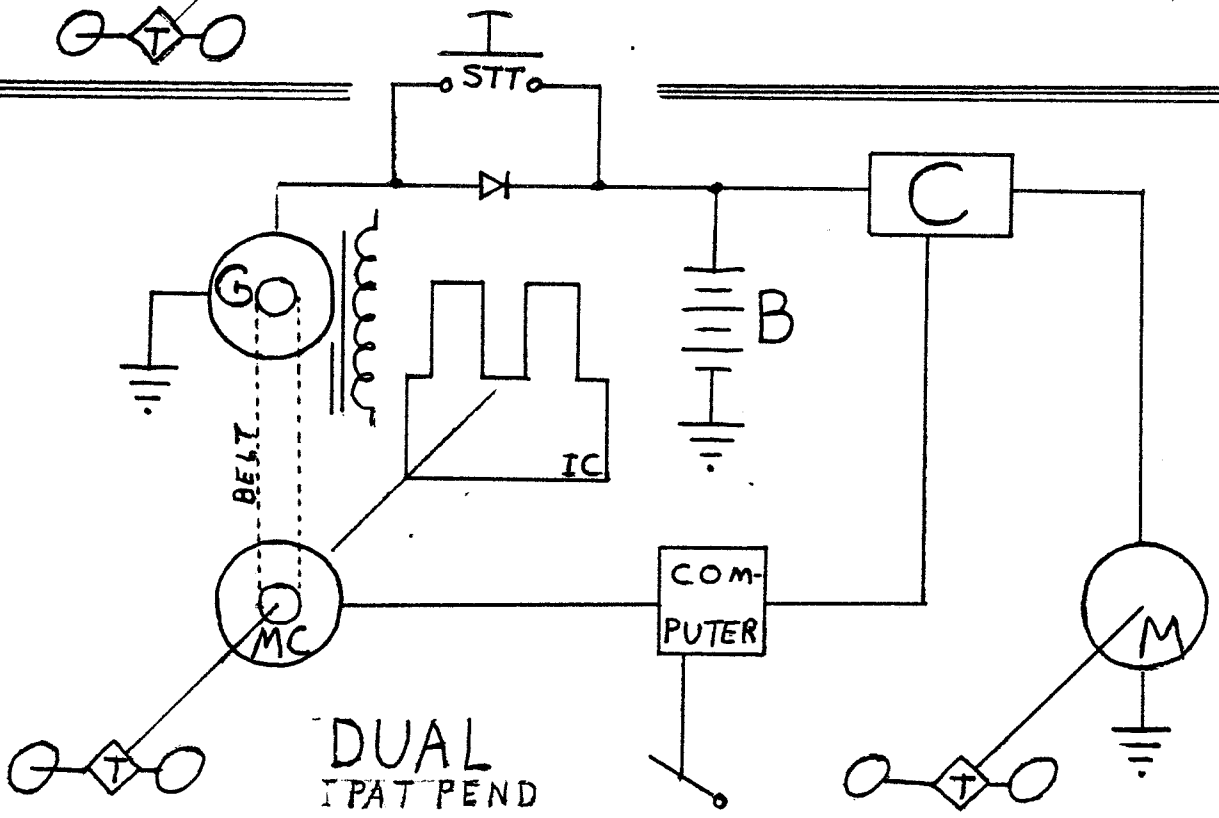
But there are problems, too. Recharge time is 10 hours, and battery cost is high and likely to remain so.

So work goes on. The British government is still financing research. Clive Sinclair (is there any field he isn't involved in?) has announced ambitious plans for an electric car. A Swiss company is active. And in this country, Ford is still working toward a really practical electric vehicle. Someday, maybe.



PARALLEL HYBRIDS SERIES?





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At last: mass-production stepless transmission

This summer, Fiat plans to introduce a small hatchback equipped with a continuously variable transmission. Stepless ratio changes give the automatic the efficiency of a manual.

By DAVID SCOTT

For years, engineers have been talking about the advantages of a continuously variable transmission (CVT). Now, the world's first CVT-equipped production automobile is coming on the market. It's the Fiat Uno 70, a baby front-wheel-drive car with Uno-matic transmission [PS, June '80].

But it won't be alone for long. It will soon be joined by other CVT models produced by other major manufacturers in what promises to become a major European marketing battle.

CVTs, used with industrial-type drives for some time, are desirable because they allow stepless ratio changes in a vehicle's transmission. As a result, engines run at near-constant speed, within their most fuel-efficient rev range, despite the load or the driver's power demands. And CVT avoids the hydraulic losses of the usual torque converter.

The Fiat CVT works by varying the working diameters of two pulleys. A steel belt linking the pulleys rides in a V-shape groove on both pulleys (photo, next page). A continuous range of ratio changes is achieved by changing the belt position in these grooves.

An input gearset drives a primary pulley, linked to the secondary pulley and output gear by this unusual steel belt. A hydraulic cylinder built into one of the cones for each pulley moves it axially, changing the spacing relative to the fixed cone.

This pinching action between the cones clamps the steel belt anywhere along the V-shape pulley grooves. The axial motion of one cone on each pulley changes the working diameter of the pulley, depending on where the steel belt is clamped.

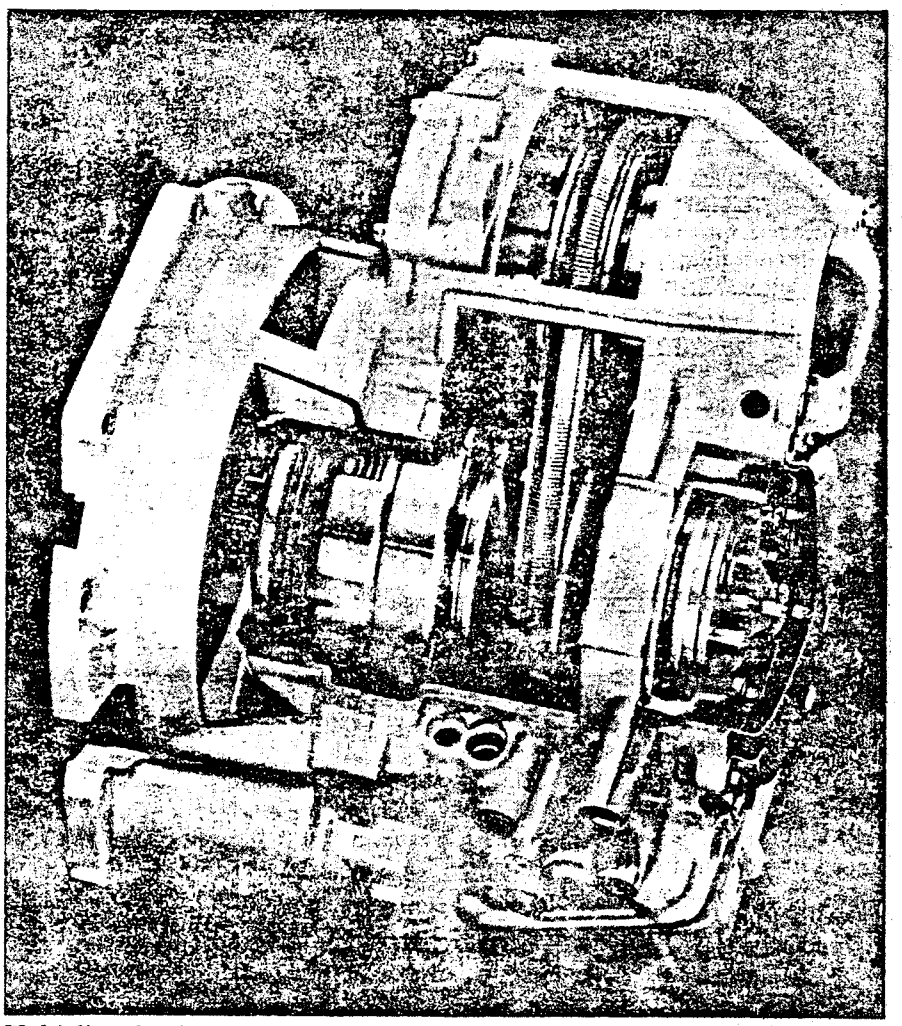
Although conventional belts rely on tension to couple power between pulleys, the CVT's drive belt doesn't. Instead, the secondary pulley is pushed into rotation by the steel belt. The belt is a laminated loop of bands carrying an endless string of thin, bead-like blocks.

As the primary pulley turns, it compresses the train of blocks on one side into a rigid stack. This pushes against the secondary pulley, causing it to rotate. Cone spacing of the output pulley is varied in the same way. During initial start-up, the input pulley is set at maximum spacing for a minimum diameter, giving the equivalent of the bottom-gear ratio. The output pulley is closed up for maximum diameter.

Spacing of the two pulleys changes in opposition as the car speed increases, giving glissando shifts in ratio. The pulleys move in step so the belt loop is always taut, and clamping pressure is optimized. These variations are controlled automatically by a system of hydraulic valves, which in turn are regulated by input signals registering throttle position, engine speed, and torque demand.

Fiat's Uno-matic transmission was developed by van Doorne's Transmissie, a small Dutch firm. The CVT design just described has been undergoing testing for several years. The transmission is very compact, making it suitable for transverse engines in

Continued



Multi-disc clutch packs (left) on input shaft of Fiat Uno-matic CVT engage forward and reverse, and drive primary pulley linked by belt to output pulley.

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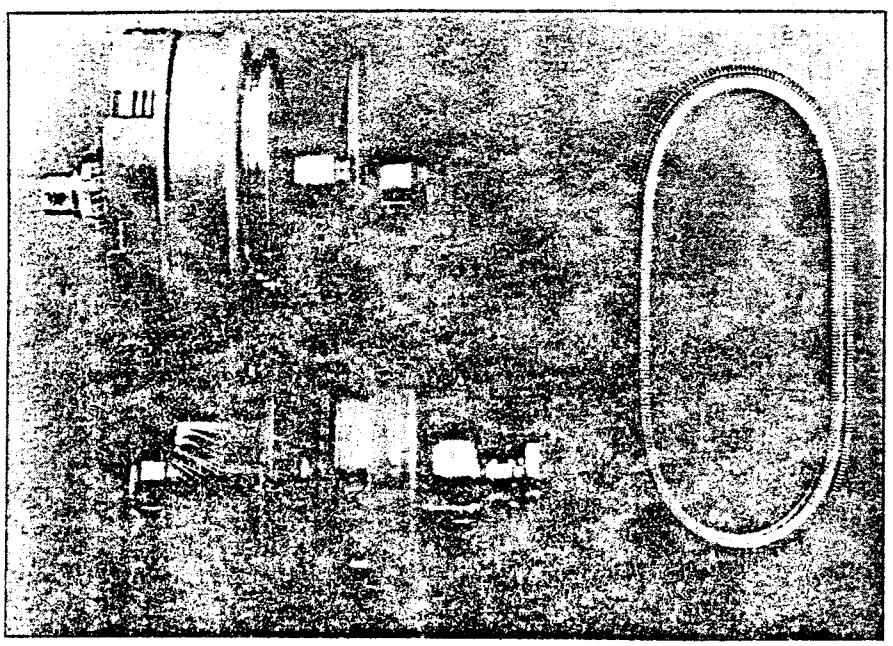
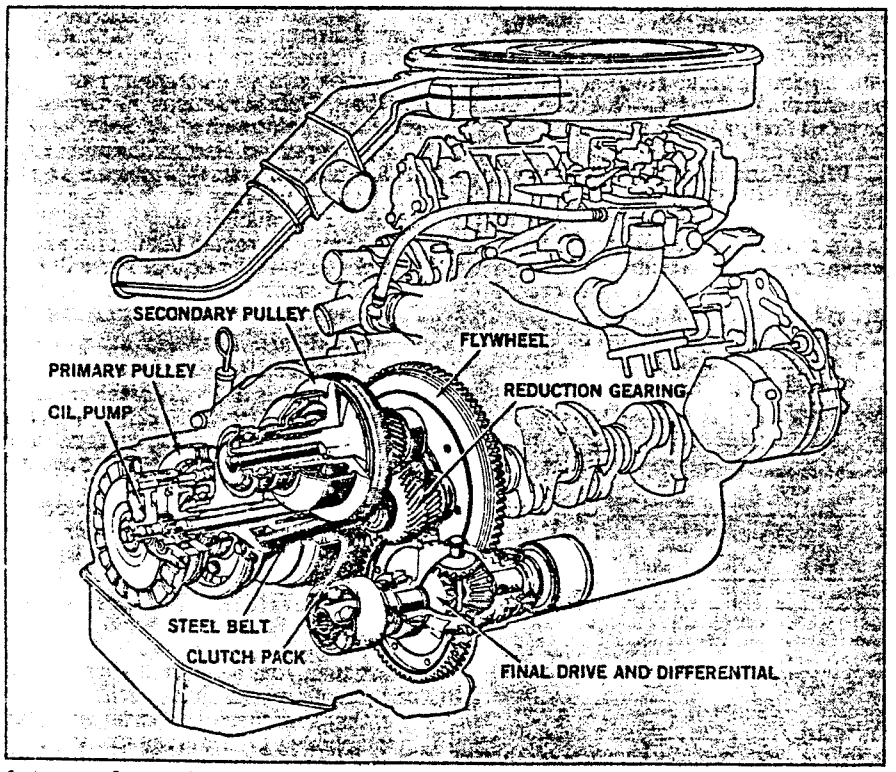
Stepless transmission



Primary-pulley assembly (top) for van Doorne CVT includes multi-plate clutch, planetary gearset, and hydraulics. Output gear is part of the secondary pulley.



Layout of van Doorne CVT for Fiat Uno transverse-engine hatchback capitalizes on the wide shift-ratio spread in a short, compact transmission package. Input power from the engine is coupled through a multi-plate wet-clutch pack that provides forward or reverse drive with a gear train. Pulley diameters are varied by sliding pulley cones, which act as a piston in a hydraulic cylinder supplied by the CVT oil pump. This positions a steel belt—320 thin blocks threaded around a loop of laminated bands—at different depths within V-shape pulley grooves. Power is coupled to the secondary pulley when blocks on the steel belt are compressed, forming a rigid stack that pushes the output pulley into rotation. As the primary pulley is widened, for example, cones of the secondary pulley are narrowed hydraulically to accommodate the fixed belt length. (The blocks moving between the pulleys travel slightly faster than the steel loop threaded through them.) Cylinder pressure and cone spacing on the pulleys are affected by the following: drive ratio in operation, which can be detected by a simple mechanical sensor for the primary pulley; engine speed, detectable by a Pitot tube immersed in an oil-filled trough; and throttle position, sensed by a cam on the accelerator shaft. A built-in differential couples power to the vehicle's front wheels.

which space is tight. It gives the Uno 70 hatchback the same fuel economy as a manual-gearbox-equipped car—even one driven by a skilled driver able to select the best shift points.

The Uno-matics will initially be built by van Doorne's Transmissie. European Ford will later begin volume production of the same design at its transmission plant in Bordeaux, France. The Ford CVTs will be fitted to the Fiesta and supplied to Fiat and other car manufacturers.

The van Doorne design offers a wide shift ratio, 5.55:1, which is greater than Uno's normal five-speed overdrive gearbox. With a 1.3-liter [79.3-cu.-in.] engine in both its CVT and manual-shift cars, Fiat reports identical fuel-consumption figures: 47 mpg at a constant 55 mph, and 28.6 mpg for the urban test cycle.

Although the CVT is slightly slower at top speed and in acceleration from zero to 60 mph, it has superior pick-up after 25 mph. That's because the transmission always glides smoothly through the most-suitable ratio band.

The Fiat Uno-matic blends elements of a conventional automatic with CVT. Starting from rest, engine power is coupled by a pair of multiple-disc clutches, like those used in ordinary automatics. Forward or reverse lock different elements of a simple epicyclic gear train. This clutch-gear-train arrangement offers smooth, jerk-free engagement.

For its CVT, Ford is planning microcomputer instead of hydraulic control. A microprocessor regulates clutch engagement for fast starts—even when the engine is cold and revving fast. The rate at which the CVT is engaged can be selected: "comfort" or "sport" driving modes.

Ford's electronics also give precise control of steel-belt tension and clamping. This minimizes energy and, therefore, fuel demands of the hydraulic pump that powers these operations. Stepless ratio control is another electronic function for Ford: A "map" of engine performance characteristics stored in the computer allows switch-selected "economy" or "sport" shifting, according to your tastes.

CVTs are clearly slated for wide use in Europe. GM has earmarked some $162 million to make van Doorne-type units in France, perhaps by 1985. They are expected to be used with larger engines (over 1.6 liters). Volkswagen, Mercedes, and other German firms are in the picture, too.

The German entry is a dark horse in the CVT race. Fiat will be first past the post, but bigger winners may follow in a contest in which the stakes are very high. PS

Triac Motor Control for Warm-Air Systems Reduces Fuel Use and Eliminates Cool Spots

by Anthony Caristi

POPULAR ELECTRONICS AUGUST 1982

DOES the blower motor of your warm-air heating system have just one speed? If so, your furnace is not operating at optimum efficiency. In a warm-air heating system, the air should move through the heat exchanger of the furnace at a velocity that continuously varies with the temperature of the plenum.

Another shortcoming of your warm-air heating system as it is designed might be that the blower motor shuts off at times. Since a warm-air system has no inertia, you may feel a chill when the blower stops even though the room temperature is high enough to trip the thermostat and turn the burner off. Nowadays, warm-air systems are designed with a "continuous air circulation" feature. This means that the burner cycles on and off frequently, keeping the plenum warm enough to maintain continuous blower operation.

With the enexpensive and easy-to-build circuit described here, you can add both a variable-speed blower-motor control and continuous air circulation to your warm-air heating system.

Circuit Operation. The heart of the revised blower-motor control is a triac. A triac is a three-electrode semiconductor device that is triggered into conduction in response to a gate signal. The action of a triac is similar to that of a silicon-controlled rectifier (SCR), except that it can conduct current in both directions, as required in an ac circuit. As shown in the schematic (Fig. 1), a signal is applied to the gate of the triac through a thermister and diac *D2*. (A diac is a solid-state trigger device that has a breakdown voltage similar to that of a zener diode, except that it works in either direction.)

An RC time constant composed of thermistor *TCR1* and capacitor *C4* prevents the triac from delivering power to the motor for part of each half cycle of the 117-V ac waveform. When plenum temperature is low, *TCR1* has a high resistance. This lengthens the time required for the voltage to increase sufficiently to trigger the triac into conduction through *D2*. When plenum temperature is high, the triac is triggered into conduction earlier in the cycle, resulting in more power being delivered to the motor and higher operating speed.

A second trigger circuit, composed of *R2*, *C3*, and diac *D1*, is used to ensure that the motor operates at a minimum speed regardless of the temperature (and resistance) of the thermistor. A minimum blower speed is necessary since the furnace cannot operate with a blower turning too slow or not at all.

For heating and cooling systems, an optional switch has been included in the circuit so that the proportional motor control can be overridden during the cooling season. The switch provides sufficient gate signal to the triac to ensure maximum blower-motor speed.

Components *R1*, *C1*, *C2*, and *L1* are included in the circuit to smooth the steep wavefronts generated by the triac and help reduce radio-frequency interference, which is inherently produced in switching circuits such as this.

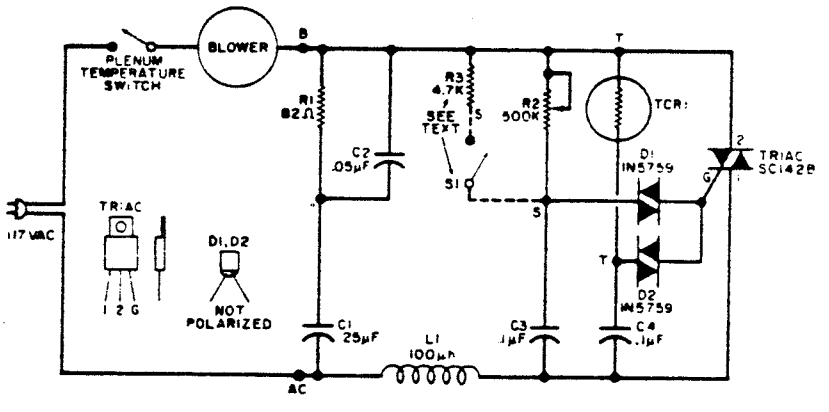


Fig. 1. The blower-motor control circuit is based on the use of a triac.

Construction. The circuit can be constructed on a small printed-circuit board measuring about 3" by 3". The only external components are the thermistor and optional switch *S1*. Figure 2 shows a full-size foil pattern, and Fig. 3 shows the parts layout.

Since this circuit is powered directly from the ac power line, all capacitors must have at least a 200-V rating. Do not use low-voltage types designed for solid-state circuits.

The blower motor will draw several amperes through the triac during operation, which will result in some power being dissipated in the device. It is recommended that a small heat sink be used to help keep the triac from overheating. A simple heatsink can be constructed by bending a 1" by 3" piece of sheet aluminum into a U shape. Drill a hole through the center of the aluminum and mount the triac and heatsink to the printed circuit board with a #4 machine screw and nut. Use heat sink compound between the mounting tab of the triac and the heat sink for best heat conduction. Be sure to keep the heat sink completely insulated from any metal part of the furnace when installing the pc board.

Inductor *L1* can be easily constructed by winding about 15 turns of #20 enamel wire on a wood or plastic 3/8"-diameter form. The inductance of *L1* is not critical, but do not use wire of smaller gauge since *L1* must be able to

PARTS LIST

C1—0.25-μF, 200-V tubular capacitor
C2—0.05-μF, 200-V tubular capacitor
C3,C4—0.1-μF, 200-V tubular or disc ceramic capacitor
D1,D2—1N5758 diac or equivalent
L1—100-μH, 5-A choke (see text)
R1—82-ohm, ¼-W, 10% composition resistor
R2—500-kilohm, pc-mount potentiometer
R3—4.7-kilohm, ¼-W, 10% composition resistor
S1—Spst switch
TCR1—200-kilohm at 25°C thermistor (Keystone Part No. RL1004-104550-155-D1 or equivalent)
Triac—SC142B or similar

carry the full load current of the blower motor without overheating. The same caution applies to the foil pattern which is shown in Fig. 2. Be sure to keep the conductive paths to the triac wide (as illustrated).

The pc board can be mounted inside the furnace where the other electrical controls are located. The schematic diagram and printed-circuit layout are marked with the letters AC, B, S, and T, which will help you identify connections to the external parts of the circuit.

Run a pair of wires for the thermistor from the "T" terminals on the pc board up to a convenient place on the plenum where the thermistor can readily sense temperature changes. Drill a small hole in the plenum sheet metal to insert the thermistor so that the air flow will pass over it. Be sure to insulate the thermistor and its connections so that no possible short-circuit to the metal parts of the furnace can occur.

If this should happen, the pc board or its components could be destroyed. Do not cover the head of the thermistor with insulation, since this will tend to make the component less sensitive to the changing temperature of the plenum.

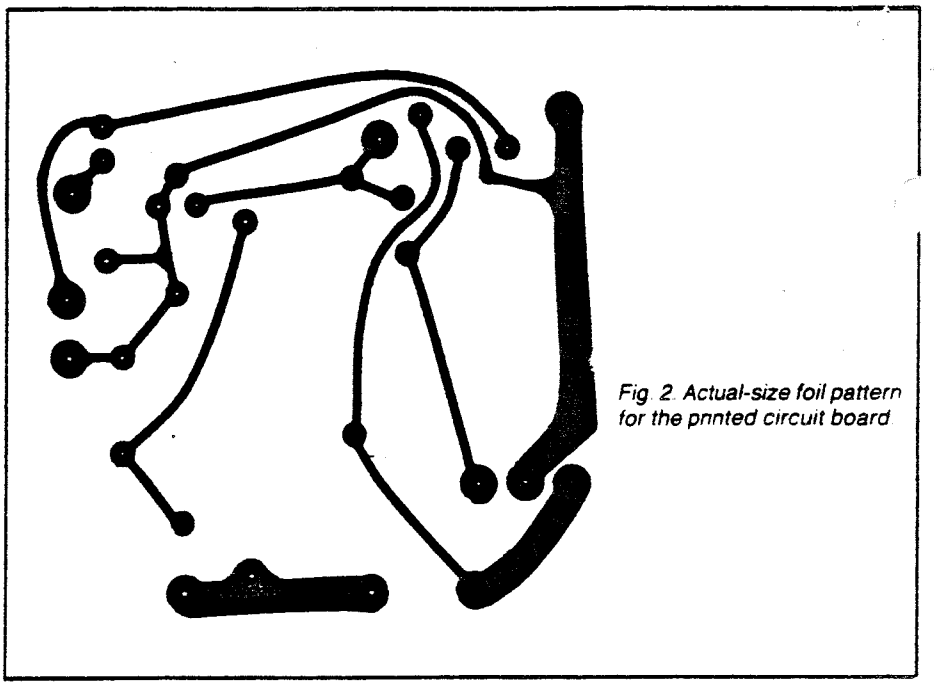


Fig. 2. Actual-size foil pattern for the printed circuit board.

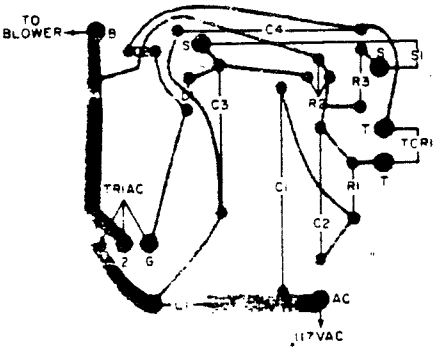


Fig. 3. Use this guide to assemble the components on the pc board.

Checkout and Adjustment. Before applying power to the furnace, check all connections to make sure the wiring is correct. To set the minimum blower speed, temporarily turn on the furnace by manually adjusting the plenum temperature switch or connecting a jumper across the switch to complete the circuit. (This must be done while the plenum is cool. If necessary, run the blower with the gas or oil burner off until the plenum is cool to the touch.) Then adjust *R2* for the minimum desired blower speed.

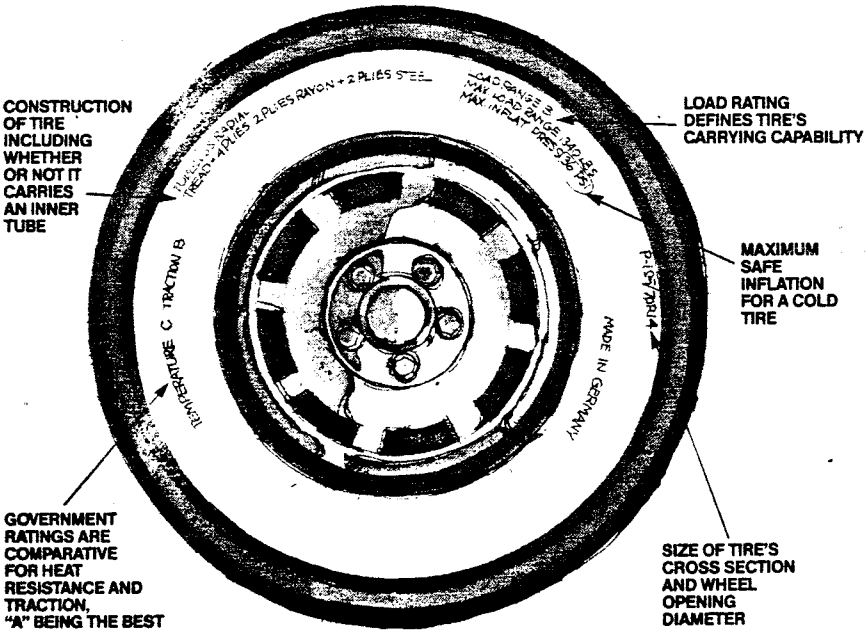
Now reset the plenum switch back to its original position (which should be somewhere between 90° and 110° F), or remove the temporary jumper. Set the room thermostat so that it calls for heat. Now, as the furnace heats up and the blower comes on, the blower speed will automatically increase as the plenum temperature rises. Conversely, when the thermostat shuts the burner off, the blower speed will decrease as the plenum cools.

Ideally, the blower will continue to operate at minimum speed until the thermostat turns the burner on again. This continuous air circulation will greatly enhance the comfort level of your home, and will help you conserve heating fuel too. ◇

◇ Battery car

Batricar's upholstered seat and armrests make disabled persons comfortable as they drive the electric vehicle. Its range is 30 miles, and top speed is four mph, says Batricar Ltd. (Griffin Mill, Thrupp, Stroud, Gloucester GL5 2AZ, England). Options: hood and wheeled carryall.

How To Read A Tire's Sidewall



The markings on a tire's sidewall provide important information to the consumer, such as size, speed capability, inflation pressure, load capacity and quality grades.

You may not be able to judge a book by its cover, but you can tell a lot about a tire by what's printed on its sidewall. Not the gee-whiz raised white letters, but rather the fine print that's required by the Rubber Manufacturers' Association and the Federal government.

The size markings are first. For instance, a tire might be marked P195/75R14.

The "P" indicates that it is a "P-metric" tire—a tire for the American market that's designed to run at 35 psi of inflation pressure for improved fuel economy.

The "195" is the section width—roughly the width of the tire through its sidewalls—expressed in millimeters.

The "75" following the slash is the aspect ratio—the height of the tire body divided by the width, expressed as a percent. A 75- or 80-series tire is standard for most vehicles, while the lower-profile 60- or 50-series tires are usually found on high-performance cars.

The "R" indicates that the tire is radial. (A "D" would indicate diagonal, or bias, construction.) The "14" is the diameter of the rim that the tire fits, expressed in inches.

Not long ago, American tires were sized using an alphanumeric code, such as ER78-14. Your car may still have these alphanumeric tires. If so, most tire dealers will be able to tell you which size metric tires to use as a replacement.

A European or Japanese tire might be marked 195SR14. Again, the first numbers indicate section width, the last indicate rim diameter and the "R" indicates radial construction.

The "S" is a speed rating, indicating that the tire is designed for vehicles with a certain maximum speed capability.

The speed rating may be of limited value in the United States, but it is quite important in other parts of the world. An "S" rating indicates that the tire is designed for cars with a maximum speed capability of 111 mph, while an "H" rating would cover vehicles with speed capabilities of up to 130 mph.

Tires with a "V" rating are designed for speeds above 130 mph, and it's no surprise that this rating is found only on the most expensive performance tires.

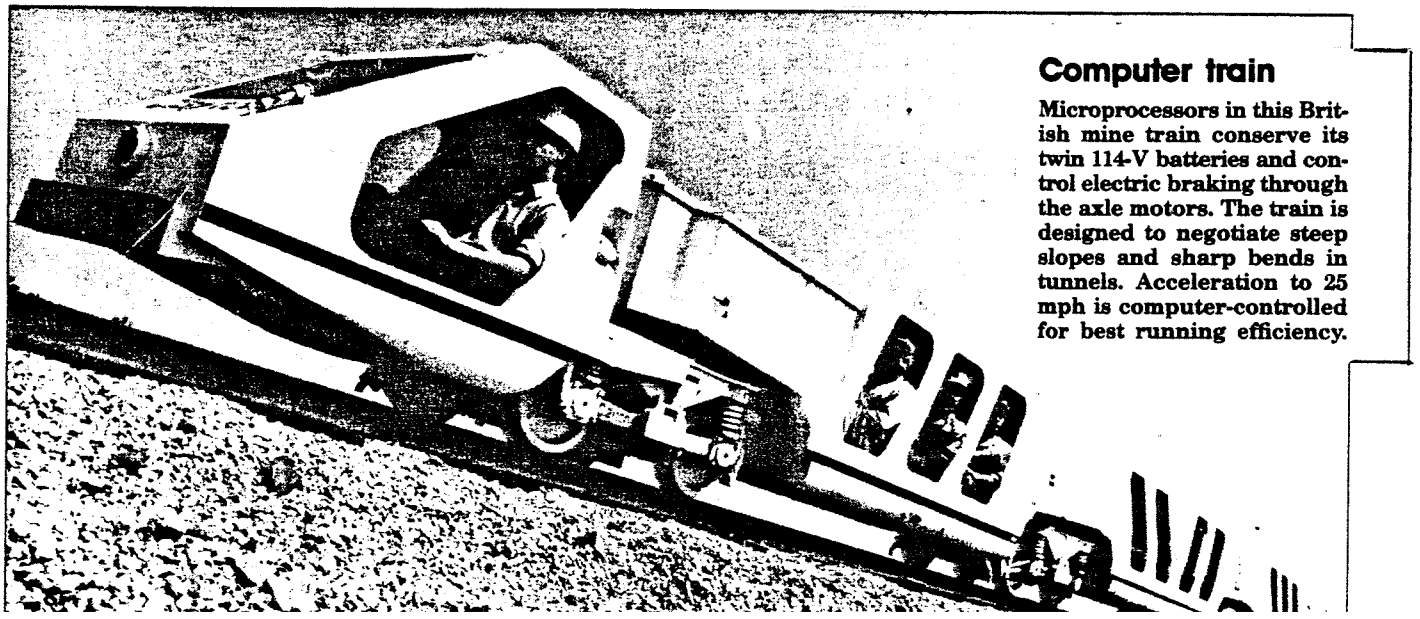
Other information on the sidewall includes the tire's maximum inflation pressure and its maximum load capacity when inflated to this pressure. "Load range B" replaces the old "four-ply" rating, and is typical of passenger tires.

Truck tires are rated at "Load Range C" and above. Load and inflation are both extremely important, as an underinflated or overloaded tire can blow out suddenly, with disastrous results.

Tires sold in America also currently carry two government tire quality grades, one for heat resistance and one for traction. A grade of "C" indicates that the tire simply passes government standards, while a "B" and "A" are progressively better. (The tread-wear rating was recently suspended due to controversy.)

An "M&S" (which stands for mud and snow) indicates that the tire meets the Rubber Manufacturers' Association standard for snow tires. Most localities that require snow tires during snow emergencies use the M&S rating as a guide.

Finally, there is the safety warning. Don't ignore it. A tire inflated to 30 or 35 psi can cause serious injury if it blows off the rim. So leave tire service to trained professionals, and don't try to use a tire or rim that is seriously damaged.—*T.R.*



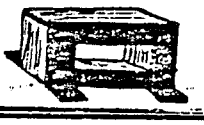
Computer train

Microprocessors in this British mine train conserve its twin 114-V batteries and control electric braking through the axle motors. The train is designed to negotiate steep slopes and sharp bends in tunnels. Acceleration to 25 mph is computer-controlled for best running efficiency.

SOLID BRASS BATTERY CONNECTORS
solder on type fits # 00 & 000
can be used on either pos. or neg. terms.

75 ¢ each

STEEL LAMINATED CHOKE CORE
can be wound with 10 turns of # 00 cable. (approx. 12 ft.)



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Overall Dimensions
5¼"L., 2½"W.

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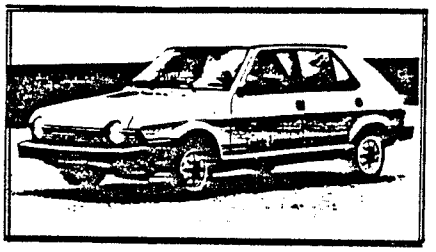
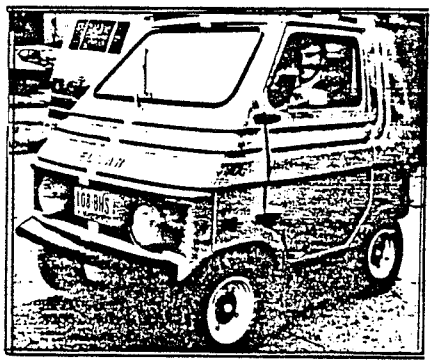
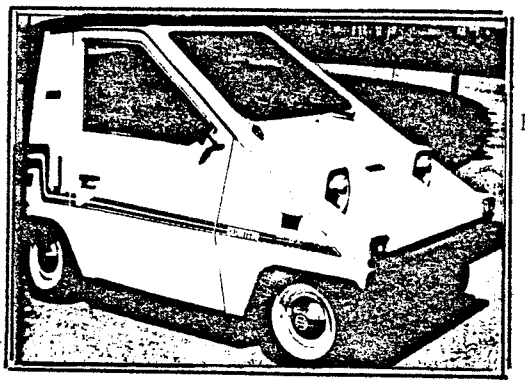


FOR SALE 1981 LECTRIC LEOPARD
Model 96A Fiat Strada 4 door
with sun roof Runs perfectly $2000.00
John Kennedy 687 - 6398
15800 Terrace Dr.
Oak Forest, Ill. 60452



FOR SALE ELCAR complete $950.00
or will seperate. Needs differential -
can use Citicar rear-end.
Chassis with fiberglass body - $175
10 Trojan batteries , 105 Amp with
less than 800 miles on them - $275
Lester batt. chgr. 48v & 12v - $135
Lambert transistor controller - $495
6 H.P. GE series wnd. 48v Mtr. - $295
Don Kubick 437 - 0453
249 Arlington Heights Rd.
Elk Grove Village, Ill. 60007



For Sale CITICAR Sebring Vanguard
1976 Yellow Good condition Low miles
Rebuilt contactors 8 6volt batteries.
Must sell - moving. $1400
Stanley Gron 968-7176 Downers Grove