MEETING NOTICE

The next meeting will be friday **MAY 15th,** at *CRAGIN FEDERAL SAVINGS & LOAN* 333 W. Wesley St. Wheaton, Illinois. - Time - 7:30 P.M. *sharp.* Guests are welcome and need not be members to attend the meeting.

REVOLUTIONARY BATTERY DEVELOPMENT FOR ELECTRIC AUTO INDUSTRY

Lectra-Matci Automobile Copr., (OTC), the exclusive importers in North America, Canada, Mexico and the Caribbean of the 'WHISPER" All-Electric automobile, in association with another company, plans to develop and produce a patented battery system which is expected to develop a range of 450 miles without recharging, an increase of more than 500% over today's existing products. This is the prediction of T. Emerson Ivey, Jr., President of Tech Systems International regarding the energy system known as the Fluid Circulation Storage Battery (FCSB).

Mr. Ivey states, "The electric vehicle industry has long sought the answer to an extended range, energy storage system for vehicles. Our FCSB system employs electrolytic particles suspended in fluid with special membranes and a miniature pump to circulate the fluid to provide energy to the motor of the electric vehicle. The new system will be lighter and more cost-effective, cutting the present weight of batteries by up to 50%.

Since last October, when the first "WHISPER" automobile was introduced at the Fontainbleu Hotel in Miami Beach, hundreds of dealers and distributors have expressed interest in the 2-door "WHISPER," which comes with an automatic transmission, seats four, employs front wheel drive, rack and pinion steering, and McPherson struts. The new all-electric "WHISPER" automobile may be operated at a power cost estimated at less than 2¢ per mile.

Sydney Mass, Vice President of LECTRA-MATIC, predicts explosive growth in the electric vehicle market over the next few years.

Deliveries of the '86 "WHISPER" are scheduled to commence in January 1986, and will have a suggested retail price of only $8,900.00 FOB Miami.

Asked a child: "Why doesn't Daddy have hair on his head?" "Daddy thinks a great deal, dear." The child mulled this over and then wanted to know, "But, Mummy, why do you have so much hair on your head?" "Hush—and eat your breakfast!"

FOX VALLEY ELECTRIC
AUTO ASSOCIATION
624 Pershing St. Wheaton, Il 60187

FIRST CLASS

ADDRESS CORRECTION
REQUESTED

Minutes FVEAA Meeting 4/24/87 at Cragin Federal Savings & Loan Office, Wheaton, IL

President W.H. Shafer called the meeting to order at 7:45PM.

There were 16 members present.

The president reported that there is $966.98 Dollars in the NOW account and 722.90 Dollars in the savings account.

John Newton issued a written report on the club car dated April 21, 1987. John reports that the "no answer" problem is acceleration. He concludes that a larger capacity motor would be required. His report commented on 8 items concerning the club car. These items are battery, charger, relays, wheels, brakes, paint,additions and corrections made and to be made.

We have a request to use the club car as a pace car in running races of 5 and 10 Kilometers to avoid the nitrous oxide poisoning from pace cars of gasoline vehicles. John is planning to test our club car on level roads to determine its range at 12 miles per hour or the equivalent of 5 minute miles that would be the average pace of the runner.
Dana Mock agreed to chair a committee to present our club car at the June 14 Hamfest at Santa Fe.

Your secretary volunteered to have a draft of a sign to display on the club car and Paul Harris is loaning a flasher unit that plugs into a cigarette lighter to call attention to the club car at the Hamfest.

We are looking into the cost of magnetic signs for the sides of the club car.

The need for Knowing the number and operating condition of the club members electric cars for our public relations program was discussed. Please contact me at 420-1118 and give me the details on your car.

The meeting adjourned at 9:40PM.

Respectfully submitted,

Kenneth R. Woods

Kenneth R. Woods, Secretary

There are three kinds of businessmen: successful, unsuccessful and those who give lectures telling the second group how the first group did it.

New science discovery could electrify the future

Chicago Tribune, Sunday, April 12, 1987

By Jon Van
Science Writer

In what many scientists are calling the most rapid technological advance ever, researchers have in recent months found ways to conduct electricity much faster and more efficiently than ever before using nonmetallic substances once thought to be poor carriers of currents.

These discoveries—and the even more impressive ones that researchers believe are only months away—promise to revolutionize the American economy and way of life even more than the invention of the transistor and the computer have in the last three decades, experts predict.

"Nothing like this has ever happened in science before," said Arthur Freeman, a physicist at Northwestern University. "For a scientist, it is like finding the Holy Grail."

"Superconductivity developments are the most exciting new breakthroughs of our lives," said Frank Fradin, a materials scientist at Argonne National Laboratory in Du Page County. "It will change the way we live."

The focus of the new breakthroughs is superconductivity, the movement of electricity without the resistance that generates heat and wastes significant amounts of energy. Until recently, free-flowing currents were impossible except at extremely cold temperatures that were very difficult and expensive to achieve.

In the last four months however, researchers at several laboratories have been able to achieve superconductivity at temperatures three times higher than ever thought possible. Scientists believe this breakthrough will make free-flowing currents economically feasible within a few years at most, and perhaps much sooner.

With existing transmission methods, from 10 to 30 percent of electrical energy is lost as heat, experts say. Superconductivity would reduce waste to zero. Even more important, it would open up radically new and cheaper ways of generating and distributing electricity, with less reliance on imported oil.

Superconductivity may also bring an era of supercomputers small enough to sit on desktops and electric motors the size of a fist that could run an automobile, experts predict.

It could mean high-speed trains levitated above their rails by superstrong magnetic fields and a whole array of virtually frictionless mechanics.

The worldwide research effort has taken on aspects of a horse race at a county fair, and so far the accomplishments coming out of the laboratories justify the feelings of elation and competition.

An unprecedented time compression has overtaken the world's physicists, as discoveries that normally take years come so quickly that orderly communication through journals and meetings has bogged down, replaced by telephone calls, news conferences and all-night meetings that resemble show-and-tell sessions more than formal seminars.

Last December several labs announced fabrication of materials that lost resistance to carrying electrical current at minus 390 degrees Farenheit. This thrilled physicists because the temperature was higher than existing theory predicted was possible and also because the material was a ceramic instead of a metal—a totally unexpected development.

News of that discovery was like the sound of a starting gun in a scramble toward a totally new direction of research. By February ceramic materials that become superconductors at minus 284 degrees had been produced. By March several scientists had reported indications that superconductivity at minus 28 degrees is possible.

Many believe that by the end of the year, room temperature superconductivity will be achieved.

Just as the fundamental breakthroughs have proceeded in basic research, practical superconductivity technology has moved forward as quickly.

Last week researchers at Argonne ran electricity through a superconducting ceramic wire cooled only by liquid nitrogen. Scientists at Bell Labs announced a similar accomplishment.

This has extreme practical significance, researchers say.

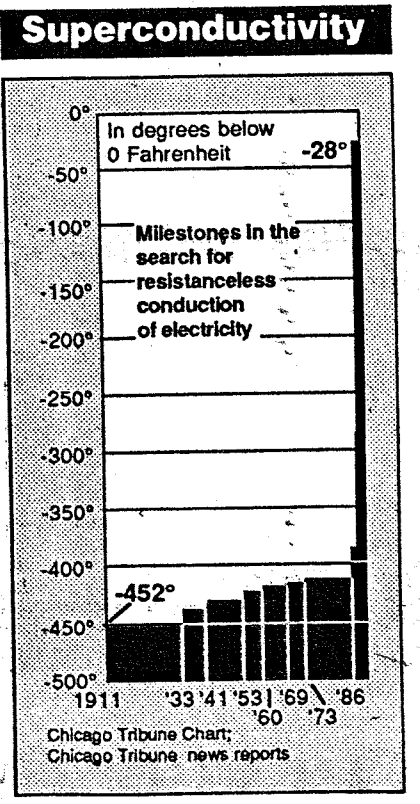
At present, superconductivity is quite expensive and is used only when absolutely essential, such as in magnetic resonance imaging for medical diagnoses for ailments ranging from tumors to neurologic disorders. This is because metal-alloy superconducting wires must be cooled to near minus 450 degrees by using liquid helium, which costs $11 a gallon and is a poor coolant.

Liquid nitrogen, which is essentially supercooled air, costs only 22 cents a gallon and is about as simple to use in a cooling system as water.

One more major accomplishment—making superconducting wires that carry large amounts of electricity—will mean that most of the promised benefits of superconductivity are within reach, experts say. Scientists at Argonne, Bell and other labs are working day and night to make just such a wire and believe they will do it by the end of the year.

Superconductivity should revolutionize all electrical technology in much the way the discovery of transistors more than 30 years ago started a revolution in electronics.

Yet years passed between the lab discovery that transistors were possible and their actual production.



Continued

Discovery

Continued

The development of superconductivity is moving so much faster, according to Northwestern's Freeman, because in the last three decades a vast array of technology has developed to help scientists in this quest.

"To go from vacuum tubes to transistors, you needed a high degree of purity in the materials you worked with," Freeman said. "That technology wasn't available. It had to be invented before work on transistors could move forward.

"Today we have the technology we need in place. We have a sophisticated superconductor technology and advanced ceramics-material technology."

Scientists have tools such as powerful electron microscopes to observe superconducting materials at the molecular level to learn their precise structure. They have powerful supercomputers on which to model new materials and study properties such as magnetism and conductivity.

Widespread high technology and generally high sophistication among scientists worldwide has taken a research backwater and thrust it into the spotlight of science in less than one year.

In Japan, where researchers already have used existing and expensive superconducting technology to build a train that travels 250 miles an hour five inches above its rails, a nationally coordinated effort has been launched to be first to take the new developments from the lab into commercial production.

Alan Schriesheim, director of Argonne, has testified before Congress that a similar national effort to coordinate superconductivity research should be undertaken in the United States to assure that America's basic research will benefit domestic industry rather than foreigners.

The reason scientists expect superconductivity to revolutionize science and industry is that the new technology rewrites our understanding of natural laws that govern electricity and magnetism.

In nearly all existing applications, wires conducting electric current resist conduction. Energy must be expended to overcome that resistance, and that energy manifests itself as heat.

Except for certain electrical appliances such as toasters and hair dryers, this heat is wasted energy that limits the usefulness of electrical technology. The amount of heat given off limits the miniaturization of electrical motors and computer chips.

Because eliminating resistance through superconductivity eliminates heat, more electricity can travel faster over shorter distances. It translates into smaller, more powerful motors and smaller, faster-working computer chips.

Also the new ceramic materials, which are oxides of yttrium, barium and copper, appear to permit superconductivity in the presence of magnetic fields much stronger than anything known.

Tests done at Argonne in January showed that ceramic superconductors could withstand magnetic fields so powerful they exceed our ability to test them directly, said Argonne's Donald Capone.

Extremely powerful magnetic fields produced by electromagnets made with superconducting wires have several potential uses.

State-of-the-art superconducting magnets are the heart of the atom smasher at Fermilab near Batavia in Du Page County. At Fermilab, subatomic particles are focused into beams by magnetic fields and slammed into each other so that physicists may observe the products of the collisions and test theories about the nature of energy and matter.

Fermilab's Tevatron accelerator, a racetrack for protons that is 3 miles in circumference, is the model for a 52-mile accelerator the federal government may build at a cost of $6 billion. The purpose of the new machine, called a Superconducting Super Collider [SSC], would be to reproduce conditions of the Big Bang when the universe was born.

Some scientists have suggested the SSC as planned will be obsolete by the time it is completed if it uses existing technology instead of waiting for the new superconductor technology that is progressing so rapidly.

Another potential application for superconducting electromagnets may be in fusion energy. Fusion is the combination of light elements, such as hydrogen isotopes, into heavier elements.

It is the energy source for the sun and for hydrogen bombs. Fusion is expected to be a potentially safe and clean type of nuclear power that would herald an era of unlimited cheap electricity.

A major limitation to developing fusion technology has been its dependence upon ultrahot charged gases called plasmas. These must be so hot for fusion to work that if they touch any physical container they cool down.

A solution may be to contain plasmas within an ultrastrong magnetic field where they wouldn't touch any physical material.

Other energy-related applications concern the lack of resistance of superconducting lines. This would allow utility companies to generate electricity using hydroelectric plants in remote mountain areas or solar energy from deserts. Electricity could then be transmitted great distances to urban users on superconducting wires without energy loss.

Another superconductor property is the potential for electric current to flow continuously around coils of superconducting wire without losing energy. This would provide an efficient way for utilities to store electricity. Generators could run at the same rate around the clock, storing excess power when it wasn't needed and drawing on the storage during peak loads.

Announcements: There is an emergency in the parking lot. The lights of a Lincoln Continental Mark VII were left on, the Volkswagon in front of it is beginning to melt.

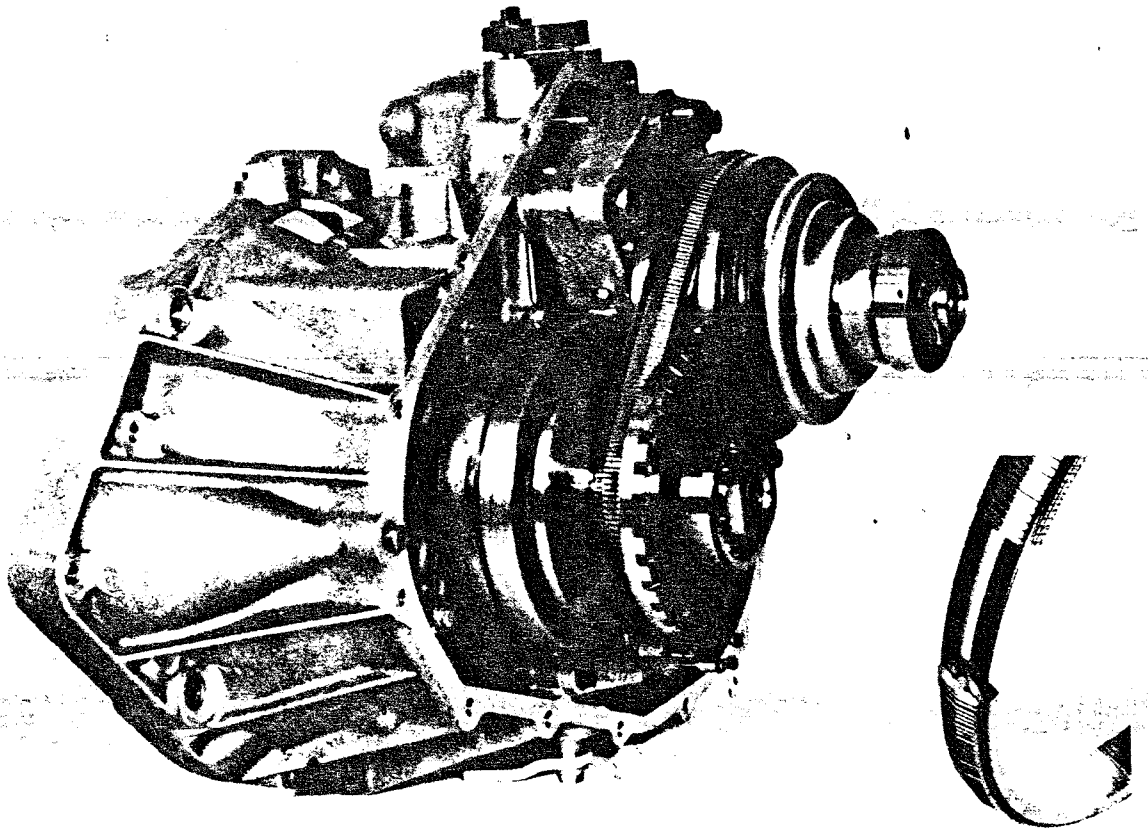
Amoco Oil Co. calls methanol an uneconomic motor fuel that may never be a viable substitute for gasoline.

Amoco said the technology to produce methanol and develop methanol-powered vehicles is well developed. However, the product cannot compete with gasoline.

"Even at 45 cents a gallon, methanol is not competitive with gasoline," said Keith W. McHenry, Amoco's Vice President of Research and Development. Since its energy content is only half of that of gasoline, "about 1.8 gallons of a blend consisting of 90 percent methanol and 10 percent gasoline are needed to travel the distance attained with one gallon of gasoline."

* * *

CVT
—the no-shift transmission



A "beaded" belt moves on pulleys for continuously variable transmission

By DAVID SCOTT

TILBURG, HOLLAND

"Just push on the accelerator," said Seian van der Veen from the passenger seat. "You'll feel the difference." I eased the pedal down, the engine note rose above its idle purr, and the car rolled off smoothly. Everything normal. But as I pressed harder, accelerating to 30 mph, I sensed two oddities: The tachometer showed engine speed stayed at around 3000 rpm, and there were no transmission shifts.

The front-drive Fiat Strada I was driving in Tilburg has a CVT (continuously variable transmission) that could be a real breakthrough in fuel economy, compactness, and manufacturing cost. It has no gears. This is a belt-drive Transmatic developed in Holland by van Doorne's Transmissie, where van der Veen is the project chief.

"With no gears to change," he explained, "it gives a wide and stepless ratio spread. That enables the engine to run at almost constant revs near its point of maximum efficiency, regardless of load or the driver's power demand. Gas consumption is thus lower

and there is no power-robbing torque converter.

The working principle is not new. Belt transmissions have been used for industrial drives for years. "But they have limitations in torque capacity, efficiency, and overall performance," van der Veen explained. The answer was a steel belt and a most unusual concept.

Belt drives normally rely on tension to transmit energy between pulleys. This one doesn't pull, it pushes, for greater no-slip torque capacity.

In its basic form, the belt is an endless string of thin, wedge-shaped blocks running loosely on a laminated steel loop, like beads on a necklace. But the blocks—not the loop—transmit the engine torque. They're held in a rigid stack by the loop, and push each other along to transmit power. The loop is laminated from 10 concentric bands of steel, each a mere 0.2 mm thick. This way-out belt design combines strength with flexibility, like multistrand wire cable. Total thickness of the pack is about two mm. When traveling between the pulleys, the loop moves slightly slower than the train of blocks. Moreover, the individual bands themselves circulate at slightly different speeds.

The ratio is altered by hydraulically widening one pulley and simultaneously narrowing the other to match the fixed belt length (see drawing). With stepless changes, the ratio is now 4:1, wider than most manual gearboxes. This will be increased to 5:1 on production transmissions for greater economy benefits. There are no gears other than one epicyclic set for reverse. A simple hydraulic control box has only two valves.

Durability? "Many of the 100 test cars with prototype transmissions have covered 100,000 miles without any failures," van der Veen told me.

Back on the road

I stamped on the throttle pedal. The engine revs momentarily shot up to 4800 rpm, then dropped to 4500. In the same instant, the car bounded ahead as the Transmatic *slid* into a lower ratio. There was not a hint of kickdown jerk.

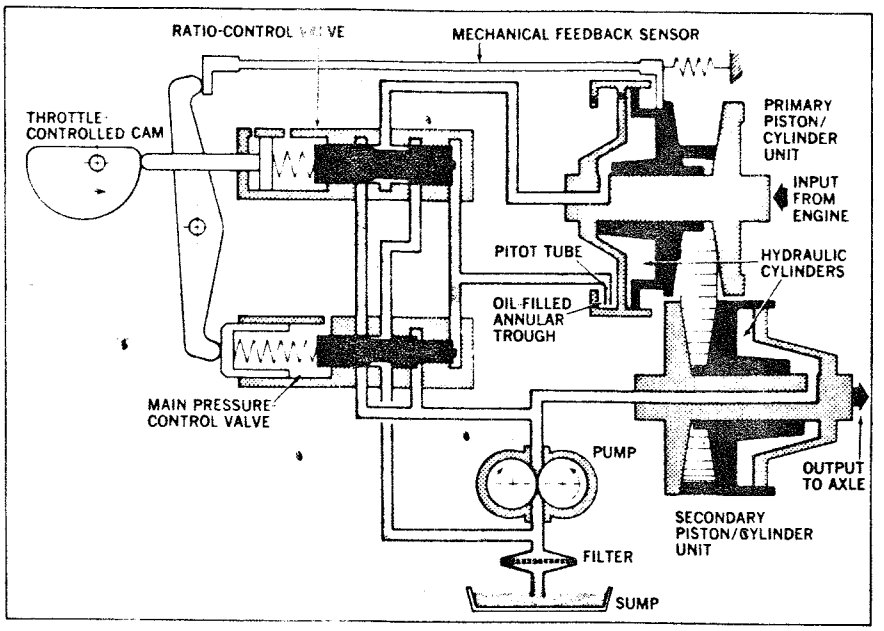
At 60 mph I eased up on the pedal and the revs smoothly fell to 3500. The pulleys were slowly shifting back to "high." With no forward gears, the transmission is completely silent.

"Now try the engine braking," van der Veen said. I lifted my foot, flipped the gear lever to one side, and the car slowed rapidly to the tune of a revved-up engine. The down-change was gentle and noiseless.

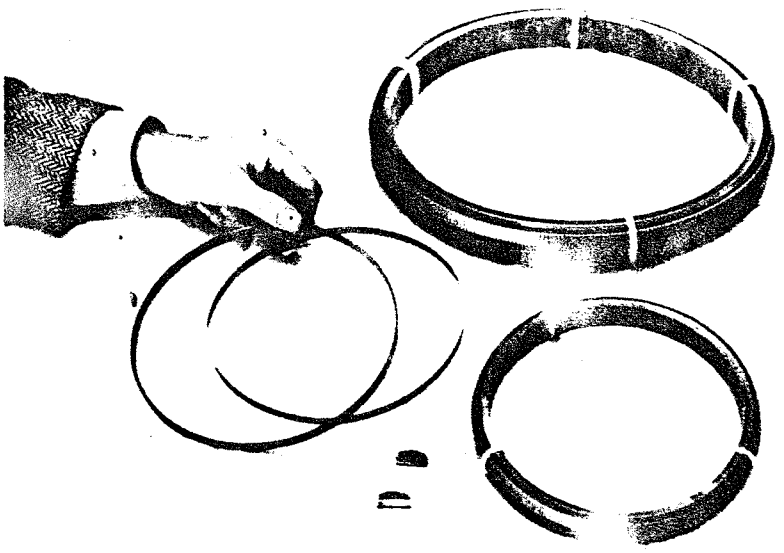
Low losses in the Transmatic contribute to the fuel-saving benefits. "Consumption now is the same as with a five-speed manual box," said a smiling van der Veen, "and up to 20 percent better than existing automatics. And widening the ratio span to 5:1 with larger pulleys will better that."

The Transmatic has some strong backers and may be in car showrooms around the world in two years. Borg-Warner linked up with the Dutch company in 1978, and will help build and assemble these revolutionary automatics in its British factories. The first production versions could be ready for the '82 model year.

Fiat is a third partner in the new group, and has contributed development know-how from experience with its own similar CVT's. It is expected to be the first major user of the transmission. The 100 prototypes van der Veen has installed have gone into models from Ford and Renault—also likely customers—as well as Fiats.



Ratio changes by varying pulley diameters. Sliding pulley cones act as a piston in a hydraulic cylinder. Cylinder pressure depends on ratio in operation, sensed by feeler on primary pulley cone; engine speed, detected by pitot tube immersed in rotating oil-filled trough; throttle, determined by cam on accelerator shaft. At rest, primary pulley contracts as shown for minimum diameter—secondary pulley is fully expanded. When engine-driven pump starts, oil feeds to secondary pulley cylinder, clamping belt to torque level determined by main valve. As speed increases, ratio-control valve eases open primary pulley, secondary pulley closes. Belt position on each pulley changes—changing the ratio between them.



Belt being held was used in Fiat Strada. Beaded construction allows it to fit pulley radius as small as 30.5 mm. Larger rear belt is for medium-weight trucks.

FVEAA CLUB ITEMS FOR SALE

QTY	DESCRIPTION OF ITEM	PRICE EACH
	SOLID BRASS BATTERY CONNECTORS 00 & 000 POS OR NEG	.75
	STEEL LAMINATED CHOKE CORE FOR SHUNT MOTORS	5.00
10'	HEAT SHRINK TUBING 3/4" SHRINKS TO APPROX 1/2" PER FOOT	.50
2	200 AMP RELAY 24-28 VOLT COIL	15.00
6	400 AMP RELAY 12 VOLT COIL	45.00
1	2/0 BATTERY CABLE 5'	4.00
1	6 VOLT BATTERY WET 7" X 16"	5.00
1	6 VOLT BATTERY WET (NEW) 7" X 12"	10.00
3	25 AMP CONTACTOR	3.00
1	400 AMP 28 VOLT CONTACTOR	10.00
1	200 AMP CONTACTOR	5.00
2	200 AMP 28 VOLT CONTACTOR	5.00
1	3AG CHASSIS MOUNT FUSE HOLDER	.50
2	IN-LINE 40 AMP FUSE HOLDER	1.00
2	IN-LINE 20 AMP FUSE HOLDER	.50
1	MJ10021 MOTOROLA TRANSISTOR	1.00
1	2N3791 TRANSISTOR	1.00
1	MR862(7620) MOTOROLA DIODE	1.00
1	1N3934B DIODE	1.00
1	Y10 OR 80063-SM-A-749148 DIODE	5.00
2	JOY MFG MOD. AV-3 5-2.75-120D 28 VOLT 60 CFM BLOWER	5.00
6	HEINEMAN CB279 28 VOLT TOGGLE RESET 3HP	1.00
3	CONVENTIONAL SIZE BATTERY HYDRACAP	3.00
2	LARGE (ABOUT 5000 WATTS) RESISTORS	15.00
2	0/0 BATTERY CABLE W/TERMINALS	1.00
2	2/0 BATTERY CABLE W/TERMINALS 12'	10.00
1	30 VOLT SERIES GE 400 AMP 3-8000 RPM MOTOR	150.00
12'	#12 STRANDED WIRE	1.00
2	1/0 BATTERY CABLE W/TERMINALS 2'9"	3.00
1	1/0 BATTERY CABLE W/TERMINALS 3'6"	3.50
1	1/0 BATTERY CABLE W/TERMINALS 4'	4.00
1	1/0 BATTERY CABLE W/TERMINALS 5'	5.00
1	1/0 BATTERY CABLE W/TERMINALS 6'	6.00
1	30 VOLT COMPOUND GE 2CM77 400 AMP MOTOR	150.00
1	VOLTMETER WESTON DC MODEL 622	20.00
1	VOLTMETER WESTON DC	25.00
1	FAN ROTON 115V MODEL BT2A-1 BISCUIT	5.00
1	DEMONSTRATOR MOTOR & CONTROLLER W/METERS & FOOT PEDAL	.00
1	COMPUTER POWER SUPPLY 5A W/MANY VOLTAGES	10.00
100'	TUBING FLEXITE	5.00
1	MOTOR G23 JACK & HEINTZ 400A (FOR PARTS ONLY)	.00
3	RELAY 12V. 3POT 3A. P&B KNP14D21	1.00
5	SOCKETS FOR ABOVE RELAYS	1.00
	NEW ITEMS	
1	PHENOLIC FLAT STOCK 37X48X3/4 CAN BE CUT	10.00
1	METER 0-50 VAC SIMPSON 2"	4.00
1	METER 0-30 AMP AC TRIPPLET 4"	4.00
1	METER 0-50 AMP AC TRIPPLET 4"	4.00
1	METER DIGITAL PANEL 2V ANALOGIC AN2532	10.00
1	METER DIGITAL PANEL 2V ANALOGIC AN2510-1B	10.00
2	METER DIGITAL PANEL 100MV WESTON M2460	10.00
1	METER DIGITAL PANEL 2V M-2865 WESTON	10.00
1	METER 0-500 MICROAMP SIMPSON 4"	4.00
1	METER 0-100V OR 0-1MA (CAL IN GAL) WESTO 4" DC2401	4.00
1	METER 0-1 MV DC 3"	4.00
1	METER 0-7.5 OR 0-30 AMP DC 2.5"	4.00
1	METER 0-1MA DC WESTON 4"	4.00
1	METER 37.85MV DC FS GE 4.5" 0-1600;0-800 DEG W/METER RELAY	4.00
1	METER RELAY CONTROL GE D-125K16-704	5.00
1	CHAIN 13/32" X 6FT RED VINYL CLAD	3.00

ove items are available from Dana Mock 759-8033

An old Chinese proverb says, "If thine enemy has wronged thee, buy each of his children a drum."

HAMFESTS 1987

May 17 Sun. 8:00 a.m. $3.00
Kankakee County Fairgrounds
Rt. 45 south Kankakee, Ill.

June 14 Sun. 6:00 a.m. $4.00
Santa Fe Park 91st & Wolf
Rd. Willow Springs, Illinois

Aug. 9 Sun. 6:00 a.m. $4.00
Santa Fe Park 91st & Wolf
Rd. Willow Springs, Illinois

Aug. 23 Sun. Commodore Fest
Kane County Fairgrounds, Ill

Sept 13 Sun. 6:00 a.m. $3.00
Santa Fe Park 91st & Wolf
Rd. Willow Springs, Illinois

Sept 19 & 20 Two days $4.00
Expo Gardens W. Northmoor rd
off 6300 block Peoria, Ill.

Oct. 25 Sun. 8:00 a.m. $3.00
Waukesha Expo Ctr. Hwys. J &
FT off I-94 Waukesha Wisc.

Oct. 31 & Nov. 1st Two days
Norris Sports Ctr. Rt. 64 &
Dunham Rd. St. Charles, Ill.

FOR SALE

10 6 volt batteries
Trojan 105 Amp $15 each

Call: Don Kubick
249 Arlington Hts. Rd.
Elk Grove Village
Illinois 60007

437-0453

WANTED

ELECTRONIC CONTROLLER
48 to 72 Volt
400 Amp
New or Used - Working
Reasonable

Call: Paul Harris
9421 N. Kildare
Skokie, Il 60076

674-6632

ELECTRIC MOTOR TERMINOLOGY

Ambient (Amb)—the temperature of the space around the motor. Most motors are designed to operate in an ambient not over 40°C (104°F). Note: A rating of 40°C Ambient is not the same as a rating of 40°C Rise; see Temperature Rise.

Air-Over—motors intended for fan and blower service. Must be located in the air stream to provide motor cooling.

Efficiency—The ratio of output power divided by input power; usually expressed as a percentage. A measure of how well the electrical energy input to a motor is converted into mechanical energy at the output shaft. The higher the efficiency, the better the conversion process.

Enclosure (Encl)—The motor's housing. Types:

Dripproof (DP)—ventilation openings in end shields & shell placed so drops of liquid falling within an angle of 15° from vertical will not affect performance. Usually used indoors, in fairly clean locations.

Totally Enclosed (TE)—no ventilation openings in motor housing (but not airtight). Used in locations which are dirty, damp, oily, etc.

Totally Enclosed, Fan-Cooled (TEFC)—Includes an external fan, in a protective shroud, to blow cooling air over the motor.

Totally Enclosed, Non-Ventilated (TENV)—not equipped with an external cooling fan. Depends on convection air for cooling, or on air flow from driven device (air-over).

Explosion-Proof (EX PRF)—a totally enclosed motor designed to withstand an internal explosion of specified gases or vapors, and not allow the internal flame or explosion to escape. See Ex.-Prf. motors for classifications.

Full-Load Amps (F/L Amps)—line current (amperage) drawn by a motor when operating at rated load and voltage. Shown on motor nameplate. Important for proper wire size selection and motor starter heater selection.

Frame—usually refers to the NEMA system of standardized motor mounting dimensions, which facilitates replacement. See facing page.

Bearings (Brgs)—basic types:

Sleeve (Slv)—preferred where low noise level is important, as on fan and blower motors. Unless otherwise stated, sleeve bearing motors listed herein can be mounted in any position, including shaft-up or shaft-down (all-position mounting).

Ball—used where higher load capacity is required or periodic lubrication is impractical. Two means used to keep out dirt:

Shields—metal rings with close running clearance on one side (single-shielded) or both sides (double-shielded) of bearing.

Seals—similar to shields, except have rubber lips that press against inner race, more effectively excluding dirt, etc.

Unit—Motors are constructed with a long, single sleeve bearing. For fan duty only. All-position mounting unless otherwise stated.

Hertz (Hz)—frequency, in cycles per second, of AC power; usually 60 Hz in USA, 50 Hz overseas. (Abbreviated Cps or Cy in the past).

Insulation (Ins)—in motors, usually classified by maximum allowable total operating temperatures: Class A-105°C (221°F), Class B-130°C (266°F), Class F-155°C (311°F), Class H-180°C (356°F).

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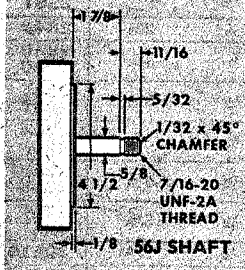
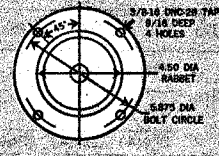
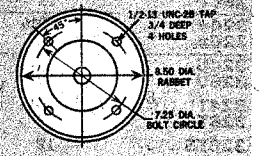
NEMA C and J-FACE MOUNT DIMENSIONS



56C, 56J, 143TC and 145TC FACE DIMENSIONS



182TC thru 215TC FACE DIMENSIONS

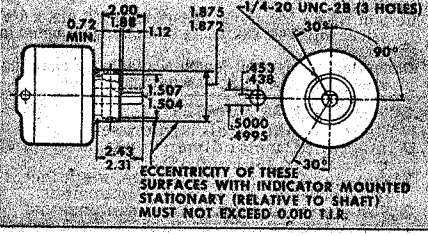


Mounting dimensions of the 56J face are exactly the same as the NEMA 56C, 143TC and 145TC faces.

56J face has a threaded shaft of stainless steel while all others have a keyed steel shaft. See illustrations and table at right for specifics.

NEMA Face	Shaft Dia. (U)	Shaft Long (N-W)	Shaft Type	Rabbet Diameter	Bolt Circle Diameter
56C	5/8"	1 7/8"	Key	4 1/2"	5 7/8"
56J	5/8	2 3/8	Thd	4 1/2	5 7/8
143TC & 145TC	7/8	2 1/4	Key	4 1/2	5 7/8
182TC & 184TC	1 1/8	2 3/4	Key	8 1/2	7 1/4
213TC & 215TC	1 3/8	3 3/8	Key	8 1/2	7 1/4

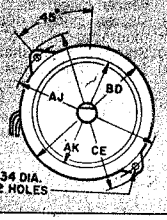
NEMA 48K and 56K HUB DIMENSIONS
SUMP PUMP MOTORS



NEMA 48M, 48N and 56N FLANGE MOUNT DIMENSIONS

OIL BURNER MOTORS

	48M	48N 56N
AJ	6¾"	7¼"
BD	6¼" max.	7" max.
AK	5⅛"	6⅜"
CE	7¾" max.	8¼" max.



ELECTRIC MOTOR TERMINOLOGY, Continued

Motor Speeds

Synchronous—the theoretical maximum speed at which an induction-type motor can operate. Synchronous speed is determined by the power line frequency and motor design (number of poles), and calculated by the formula

$$\text{Syn. RPM} = \frac{\text{Frequency in Hz} \times 120}{\text{No. of Poles}}$$

Full-load—the nominal speed at which an induction motor operates under rated input and load conditions. This will always be less than the synchronous speed and will vary depending on the rating and characteristics of the particular motor. For example, four pole 60 Hz fractional horsepower motors have a synchronous speed of 1800 rpm, a nominal full load speed (as shown on the nameplate) of 1725 rpm, and an actual full load speed typically ranging from 1715 to 1735 rpm.

Motor Types—classified by operating characteristics and/or type of power required;

Induction motors for AC operation—most common type. Speed remains relatively constant as load changes. There are several kinds of induction motors:

Single Phase—available in these types:

Shaded pole—low starting torque, low cost. Usually used in direct-drive fans and blowers, and in small gearmotors.

Permanent split capacitor (PSC)—performance and applications similar to shaded pole but more efficient, with lower line current and higher horsepower capabilities.

Split-phase start—induction run (or simply split phase)—moderate starting torque, high breakdown torque. Used on easy-starting equipment, such as belt-driven fans and blowers, grinders, centrifugal pumps, gearmotors, etc.

Capacitor-start, induction-run (or simply, capacitor start or capacitor)—high starting and break-down torque, medium starting current. Used on hard-starting applications; compressors, positive displ. pumps, farm equipt., etc.

Capacitor-start, capacitor-run—performance and applications similar to capacitor-start, induction-run, except have higher efficiency. Generally used in higher single phase HP ratings.

Three Phase—operate on 3-phase power only. High starting and breakdown torque, high efficiency, medium starting current, simple, rugged design, long life. For all types of industrial uses.

Direct Current (DC)—usable only if DC available. Usually used on adjustable-speed applications.

AC/DC (AC series or universal)—operate on AC (60 or 50 Hz) or DC power. High speed, usually 5000 RPM or more. Brush type. Speed drops rapidly as load increases. Useful for drills, saws, etc., where high output and small size are desired and speed characteristic and limited life (primarily of brushes) is acceptable.

Mounting (Mtg)—basic types:

Rigid—motor solidly fastened to equipment through metal base that is bolted or welded to motor shell.

Resilient (Res)—sometimes called rubber or rbr.—motor shell isolated from base by vibration-absorbing material, such as rubber rings on the end shields, to reduce transmission of vibration to the driven equipment.

Face or flange—shaft end has a flat mounting surface, machined to standard dimensions, with holes to allow easy, secure mounting to driven equipment. Commonly used on jet pumps, oil burners and gear reducers.

Stud—motor has bolts extending from front or rear, by which it is mounted. Often used on small, direct drive fans and blowers.

Yoke—tabs or ears are welded to motor shell, to allow bolting to a fan column or bracket. Used on fan-duty motors.

Power—The energy used to do work. Also the rate at which work is done. Measured in watts, horsepower, etc.

Power Factor—The ratio of real power (watts) divided by apparent power (volt-amperes). Do not confuse power factor with efficiency. A measure of the extent to which power transmission or distribution systems are fully utilized.

Rotation (Rot)—direction in which shaft rotates: CW = clockwise; CCW = counterclockwise; Rev = reversible, rotation can be changed. Unless stated otherwise, rotation specified in this catalog is as viewed facing shaft end of motor.

Service factor (SF, Svc Fctr) a measure of the reserve margin built into a motor. Motors rated over 1.0 SF have more than normal margin, and are used where unusual conditions such as occasional high or low voltage, momentary overloads, etc. are likely to occur.

Severe Duty—A totally enclosed motor with extra protection (shaft slinger, gasketed terminal box, etc.) to resist the entry of contaminants. Used in extra dirty, wet or other contaminated environments.

Temperature Rise—the amount by which a motor, operating under rated conditions, is hotter than its surroundings. Increasingly, manufacturers are replacing the Rise rating on the motor nameplate with a listing of the Ambient temp. rating, insulation class and service factor.

Thermal Protector—a temperature sensing device built into the motor that disconnects the motor from its power source if the temperature becomes excessive for any reason. Basic types:

Automatic-Reset (Auto)—after motor cools, protector automatically restores power. Should not be used where unexpected restarting would be hazardous.

Manual-Reset (Man)—an external button must be pushed to restore power to motor. Preferred where unexpected restarting would be hazardous, as on saws, conveyors, compressors, etc.

Impedance (Imp)—Motor is designed so that it will not burn out in less than 15 days under locked rotor (stalled) conditions, in accordance with UL standard, No. 73.

Torque—twist, or turning ability, as applied to a shaft. Measured in foot-pounds (ft-lbs), inch-pounds (in-lbs), ounce-feet (oz-ft) or ounce-inches (oz-in). In a motor, two torque values are important:

Locked rotor torque, or starting torque—the torque produced at initial start.

Breakdown torque—the maximum torque a motor will produce while running, without an abrupt drop in speed and power.

Voltage—The pressure in an electrical system. The force pushing the electric current through the circuit, like pressure in a water system.