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Energetics of Moving Magnetic Waves

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ENERGETICS OF MOVING MAGNETIC WAVES

by
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Abstract

Magnetism has had a certain and specific appeal of human inquiry for at least the past forty centuries of civilization. History is full of adventures into the unknowns about this natural phenomenon. Recent findings hint of a hidden physical world concerning magnetism which prompts continued exploration. Curvilinear motion on a continuous basis can be detected within a magnetic field consisting of large, slow moving spiral wave patterns. This paper presents a procedure whereby the reader can establish his or her own findings about the power and energy of magnetic conductance. Avenues of basic research are explored and discussed.

INTRODUCTION

Our first task is to look at magnetic suspension devices (or magnetic levitation devices). There are high current DC electromagnetic levitation devices which can be constructed to standardize the energy use of floatation with respect to elevation. (See Figure 1: Electromagnetic Levitation--Power and Energy Required for Floatation)

Magnetic materials can be constructed in specific geometric forms to produce floatation on an equivalent power basis. There emerges a numerical value to express the power of floatation at a given elevation above sea level. This value has been determined to be 7.8 watts/gmf. This is the amount of equivalent power required to achieve initial flotation at elevation 620' ± 10'. This value translates to 800 watts/Newton of force to counteract the force of gravity. In order to maintain initial floatation, the amount of energy needed becomes 7.8 Wh/h per Gmf times the total hours of levitation times the mass of the floating object. (1) This is the amount of energy in watt-hours required to maintain initial floatation on a continuous basis. For example, in one 24 hour period the equivalent energy required is 187.2 Wh/day/gmf. With magnetic materials, ceramic ferrites and rare-earth cobalts, this feat is accomplished without the gain or loss of heat energy. It is performed adiabatically on a continuous basis with only small mechanical losses due to compression demagnetization accumulating over a period of time. (See Figure 2: Production of Magnetism)

The energy to produce magnetism within a given ceramic ferrite has been determined to be 0.233 kWh/gmf. (2) This is the energy input per unit mass to produce a magnetic structure. Woods and Janeska of G. M. Research Laboratories report that a 15Kw DC pulsed power unit produced SAM magnets (Samarium-Cobalt) with (BH) maximum of 10 to 15 MGOe. (3) When magnets are clustered and arranged to dynamically oppose each other in a vertical construction, the Newtons of force produced from magnetic repulsion equal the force of gravity on the floating member, equilibrium of forces is reached and the floating member becomes "weightless" at a certain gap. (See Figure 3: Vertical Magnetic Levitation System & The D.e.p., Dynamic Equilibrium Position)

From Figure 3, for example, at the end of 24 hr. floating member B, which has a mass of 270gmf, has spent an equivalent amount of energy for levitation of 2106 Wh/h times 24 hrs. or 50.5 kWh E with a maximum P rating of 2.106Kw. From the value of 0.233 kWh/gmf being the total energy investment unit for all the magnetic materials which

FIGURE 1 ELECTROMAGNETIC LEVITATION: POWER & ENERGY REQUIRED FOR FLOATATION

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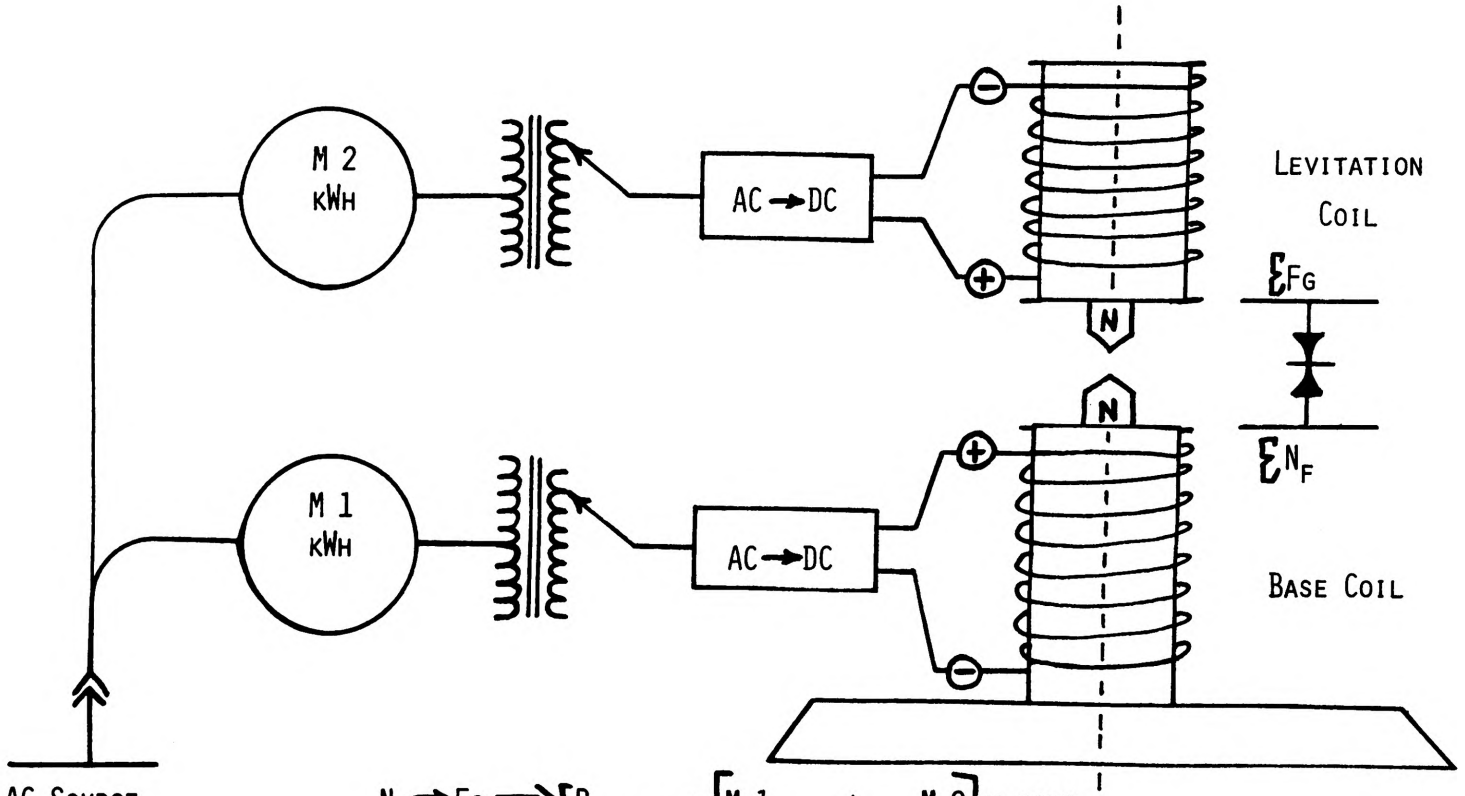

$N_F \rightleftharpoons F_G \Longrightarrow \mathcal{E}P$ WATTS $= [M\,1 + M\,2] \times 1000$

$= [KWH/HR + KWH/HR] \times 1000$

$= 800$ W/NEWTON AT ELV. 620' ± 10' MIN. GAP OR D.E.P.

$\mathcal{E}E$ W-H $= 7.8$ WH/HR PER GMF X $\mathcal{E}$MASS X $\mathcal{E}$(HRS)

FIGURE 2 PRODUCTION OF MAGNETISM (CERAMIC FERRITES)

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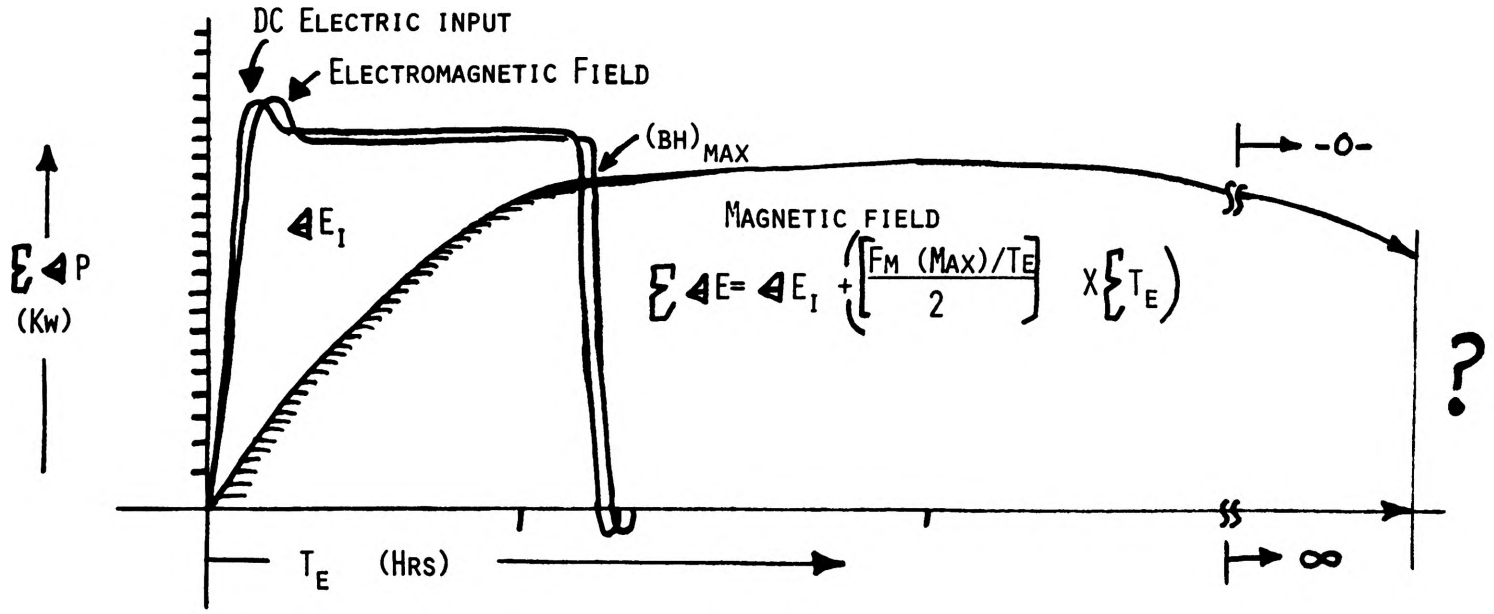
POLING ENERGY INPUT: 0.233 KWH/GMF



EVERY RUN: $F_M < \Sigma \Delta P$ BUT $\Sigma \Delta E \gg \Delta E_I$

FIGURE 3 VERTICAL MAGNETIC LEVITATION SYSTEM & THE DYNAMIC EQUILIBRIUM POSITION

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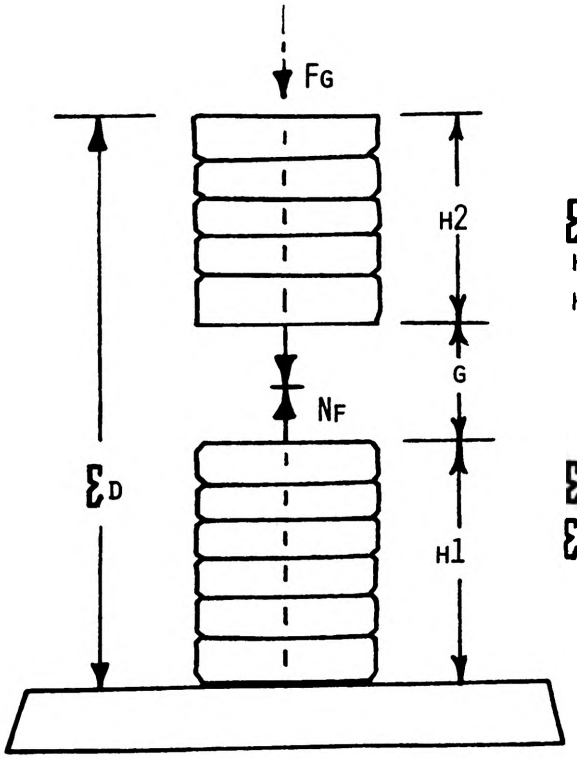

$\mathcal{E}_D$ = TOTAL DISPLACEMENT
H2 = HEIGHT OF FLOAT CLUSTER
H1 = HEIGHT OF BASE CLUSTER
G = NET GAP (D.E.P.) MM

$\mathcal{E}_D \geq (H1 + H2)$

$\mathcal{E}_D = H1 + H2 + G$

$G = D - (H1 + H2)$

TYPICAL

WT: GAP RATIOS D.E.P	FG	
13MM	90GMF	(A)
10	135	
6	180	
5	225	
2.5	270	(B)

EQUIVALENT POWER

(A) $\mathcal{E}_D$P @ 90GMF PER 13MM D.E.P. $\simeq$ 7.8WH/H/GMF X 90GMF
$\simeq$ 702 WATTS

(B) $\mathcal{E}_D$P @ 270GMF PER 2.5MM D.E.P. $\simeq$ 7.8 X 270GMF
$\simeq$ 2106 WATTS

make up both the floating member and magnetic base with total magnetic mass of 360 gmf then,

E_i = 0.233 kWh/gmf X 360gmf = 83.88 kWh input energy

It becomes plain to see that in just 1.66 days the accumulative sum of equivalent energy is reached to equal the energy invested into the system for floatation. Beyond this point, the energy equivalence of magnetic suspension continues to accumulate surpassing the amount of energy input for initial magnetization for a particular structure. Each device has its own energy payback period, so-to-speak, depending upon the structure, net loading and quality of magnetic materials used. The end point or touch down point of floatation is not determined in hours, days or months, but years. A method to estimate the longevity for the end point of magnetic levitation devices is given as follows. (See Figure 4: The occumulating Sum of Equivalent Energy of Magnetic Levitation)

The power dissipation rate for a given magnetical system is a mechanical loss rate of the D.e.p. gap for the system and does not strictly follow a linear pattern but tends to slow up as the years of floatation performance accumulate. Heat from outside sources, demand abuse on the net loading of the system, qualify and type of magnetic materials are all variables which will affect the life of a magnetic levitating system. Losses as small as 0.02% to as large as 5% per year can be expected with these working magnetical systems. In most cases, rare-earth cobalt magnetic structures are considerably more efficient in floatation devices than ceramic ferrites.

It becomes very difficult to apply our contemporary net energy analysis techniques to a system which demonstrates an $\sum \Delta E$ accumulating to over 10,000 times greater than the $\sum E_i$ for the same system. Untouched and untinkered, where does this "cold" energy come from? What is the mechanism of magnetic energy? Can the machinery of magnetic fields be "borrowed" for conversion into other forms of energy like heat, light and perhaps rotary motion? The balance of this presentation will attempt to answer these questions.

Genesis of MED (Magnetroelectrodynamics)

The conductance of magnetic energy was first dealt with by the prolific mind of James Clerk Maxwell over a period of years which ended in 1879 with his untimely death at the age of 47 due to abdominal cancer. The 1978 portion of this energy conference series produced a set of 35mm slides showing magnetic plumes produced on CRT screen surfaces. (4) When the plume combinations were brought together it becomes apparent that the Maxwell convention of a rotating magnetic field does in fact exist for every static magnetic structure, but the type of motion was not adequately presented. The fields produced from structured magnets have been considered static or motionless with consistent assumptions of inactivity which persist today. Terry has typified this assumption by stating:

> There is no such thing as a magnetic substance in the sense in which we have used it, therefore there can be no magnetic flow (5)

The Search for Moving Magnetism

I would like to introduce a procedure for your review of a laboratory method to view and determine motion or flow within a magnetic field which can be easily generated and otherwise observed. It is an initial method for discovering a pattern of wave propagations which apparently do not exist in our present electromagnetic spectrum. I have entitled these propagations as Tortic waves, named after the tortoise or turtle, because they move very slowly in a convoluting fashion over and through the surface of any magnetic material which is structured according to the following procedure.

A Laboratory Procedure for the Generation and Classification of Tortic Waves

Scope: This procedure is intended to demonstrate the existence of motion or flow within the confines and limits of a magnetic field produced from material which exhibits the property of ferromagnetism or dipole magnetism.

FIGURE 4 THE ACCUMULATING SUM OF EQUIVALENT ENERGY FOR MAGNETIC FLOATATION

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$$\Sigma \Delta E = \text{MAX.}\ \Delta P \left[\frac{(1 + D_R)^{-\mathcal{E}_N} - 1}{-D_R} \right] C$$

$$\mathcal{E}_N = \frac{\ln\left[\frac{\Sigma \Delta E \times D_r}{C \times \text{MAX.}\Delta P}\right] + 1}{\ln\left(1 + D_r\right)}$$

WHEREBY: D_R = DISSIPATION RATE OF THE D.E.P. AS % DECIMAL

$\mathcal{E}_N$ = NUMBER OF YEARS ESTIMATED FOR USEFUL D.E.P TO EXIST

C = 8760 HOURS/YEAR

ΔP = EQUIVALENT POWER IN KW

ΔE = EQUIVALENT ENERGY IN KWH

Equipment: This procedure has been modified to reduce the number of tools to a minimum so that safety and ease of observation can be optimized.

1. Magnetic structure

This is a common cluster of uniform magnetic units of the same material and mass. The least expensive units are a part number 64-1885 from Radio Shack, Inc. This is a disc type ceramic ferrite which averages 15gm per unit. It measures 28mm dia. OD, 9.2mm dia. ID x 6.3mm thick. A total of 70 units are needed for this procedure to make a single cluster or structure consisting of 60 units 37.8cm in length. The remaining 10 units form a cluster referred to as a reference magnet needed for part 3 below.

2. Stopwatch or Timer

A timing device of suitable quality electronic or mechanical timer which reads in seconds, minutes and hours.

3. Compass and Pole Reference Magnet

A compass of suitable quality is needed which can be no larger than 40mm in diameter. The reference magnet is needed for two reasons: (a) The compass needs to be checked for proper polarity; working with these Tortic waves has a tendency to reverse the polarity of the compass needle. (b) The reference magnet is also needed to correct the field reversal of the compass needle.

4. Thin plastic ruler

A flexible metric ruler is needed which measurer to the nearest 1.0mm.

5. The Bingo matrix grid

The above name describes a piece of paper which covers the radial surface of the magnet cluster. With this magnet cluster of 60n should measure about 38cm in length by 10cm wide. Wrap the paper about the cluster and with a pencil mark the unit separation along the entire length of the cluster. Trim excess paper from the end. Then unwrap the paper and draw the vertical lines. Measure the distance separating the lines and mark the horizontal lines with the same size of separation. Rewrap the cluster and see how close the firse horizontal line matches the last horizontal line with the overlap of paper. Draw a heavy line down the length of the cluster over this union and secure the paper which is now a grid of squares of equal size. There should be a finished matrix of 59 lines vertical by 14 lines horizontal to make a total of 826 grid squares. The heavy horizontal line is the horizontal origin of the cluster. This procedure must be conducted on a non-metallic bench or work surface and at least 100cm from any large ferrous based objects, pipes or obstructions.

With the cluster on the table, place the right hand on the Northing end of the cluster and left hand on the Southing end of the cluster. Secure the cluster with the origin facing up. From left to right number the vertical lines along the origin from 1 to 59. Rotate the cluster up from the origin (toward the observer) and on both ends of the cluster, letter the horizontal lines A,B,C,D, etc. The finished Bingo grid should look like the following figure. (See Figure 5: The Bingo Matrix Grid)

STEP 1. Check the compass with the reference magnet, (N) pole of the compass should point to the (S) pole of the reference magnet.

2. Along the horizontal origin line move from (S) to (N) with the compass held flat on the curved surface of the cluster. Observe the minute deflections. A predominant deflection exists at or near A-30 with minor deflections at points A-15 and A-40.

3. Rotate the cluster along line 30 and find the point of maximum deflection. This is the FRA or Field Reversal Area. Should you move the compass too fast over this point, you will see the compass needle reverse its polarity and the reference magnet will be needed to correct the switch.

4. To verify the center of the FRA, hold the compass perpendicular to the tangent surface of the cluster and move back and forth over the spot several times to establish a fixed point. Mark this spot on the grid paper and start the timer.

5. Scan the surface with the compass along the horizontal origin and mark the positions of the less predominant deflections.

FIGURE 5 BINGO MATRIX GRID

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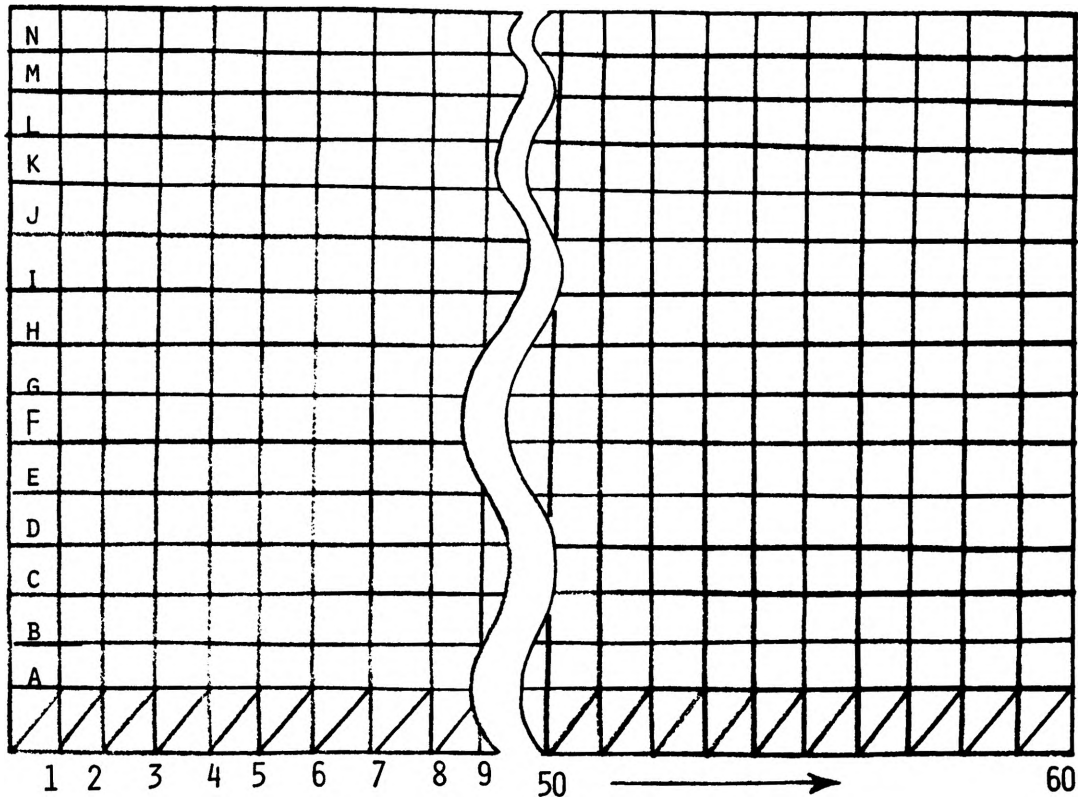

6. After 15 minutes return to the center FRA and find the maximum point of deflection once again. Is it in a different location related to the first center point of the FRA? Mark its location and observe the timer. Record the elapsed time and measure the distance between the two points.

7. Wait 15 minutes and repeat steps 1,4,5, & 6.

8. After 4 hours of marking positions on the grid, remove the grid paper and connect the dots with a line along each path of deflections. You will notice several paths have formed paralleling each other.

Interpretation of Results

1. Staying with this procedure for at least 4 hours, the matrix grid paper becomes laden with many dots and specific paths of a movement with a repeating process. The speed and direction for the paths are very close to the same; 2.6cm/hr and moves along a center line of A-30 to E-30 direction. It convolutes at or near the surface at a speed of 1.8 radians/hr. One complete cycle takes 3.5 hours and repeats itself with a wave displacement of between 4.5 to 5.0cm.

2. Magnetic waves are elastic with certain limits of performance. When compressed or torqued by the presence of another cluster with wave trains going in the same direction the wave displacement is reduced. The FRA represents the peak of the wave train with two minor peaks, one on each side. The field momentum is related to the elastic properties of a given section of this wave train. The stresses on the needle indicate a strain of the wave train.

3. The aspect ratio is the geometric relationship of the cluster length to the cluster diameter. In the case of the 60n cluster, the R_a is L/D = 13.57. There is a relationship of R_a to the number of Tortic wave trains that are generated. Two Tortic wave trains exist on a 90n cluster with a R_a of 19.9. It has been found that regardless of the dimensions of the disc magnet used, any cluster with an R_a over 6.23 will demonstrate the existence of at least one-half of a Tortic wave. A composite view of this wave train is given in the following figure. (See Figure 6: Tortic Wave Train on a 60n Cluster)

Special electronic circuits detect magnetic wave motion much more definitively than the compass. OP Amp chips and hybrid circuits with digital readouts are a lot more expressive of the wave motion. With the same Bingo matrix grid the Tortic wave movements become very pronounced. (See Figure 7: Digital Prob Scan of 60n Cluster)

4. The Tortic waves represent a stressed magnetic field stretched beyond normal limits of field performance. The plume field from a cluster with a R_a less than 6 truncates into a condensed spiral form as the distance between the end poles is increased by the addition of more unit magnets to the cluster. When the cluster is reduced back to size with the R_a less than 3.0, the Tortic waves cannot be detected.

Possible Energy Connections

From 1965 to 1967, Yasui gives a detailed account of earthquake lights observed during the Matsushiro earthquake swarm in Japan. (6) Visible monochromic light is produced in a hemispherical body between 20 to 200 meters in diameter and can occur on both land and sea, both preceding and following an earthquake. The light is relucent with reflective properties which makes the source difficult to locate and lasts up to 2 minutes after the earthquake hits. Radio interference generally follows the luminescence period and is strongest in the 10 to 20 kHz range. During the luminescence period there is no apparent effect on magnetometers. No correlation is drawn between the Richter scale reading and the intensity level of the earthquake lights.

The fact that luminescence occurs in some cases prior to an earthquake is an indication of an energy form generated as a pre-seismic activity. Rapidly changing geomagnetic disturbances do not register on magnetometers because they are designed for static field variations. Many tons of earth-mass below the surface move short distances to produce surface quakes and micropulsations of a vibrat-

FIGURE 6 TORTIC WAVE TRAIN ON 60N MAGNETIC CLUSTER

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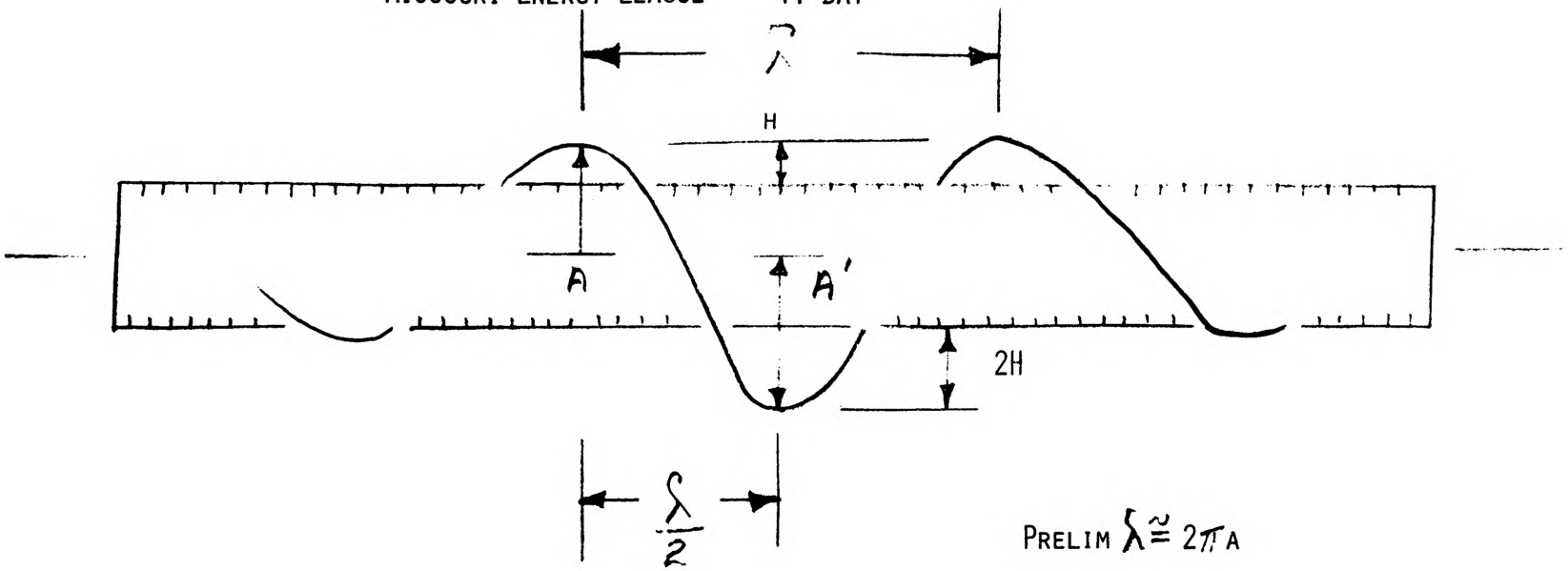

PRELIM $\lambda \cong 2\pi A$

$A' > A$

FIGURE 7 DIGITAL PROBE SCAN OF 60N MAGNETIC CLUSTER AT L 27

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	TIME	18:15	18:16	18:18	18:20	18:25	18:30	18:35
L 27	A	28	37	40	31	21	27	24
	B	19	26	29	13	11	17	11
	C	10	20	18	9	3	9	3
	D	8	13	-	0	1	10	2
	E	4	4	-	0	0	0	0
	F	0	0	-	0	0	0	0
	G	0	0	-	0	0	0	0
	H	0	0	-	0	0	0	0
	I	0	0	-	4	1	0	0
	J	9	10	-	11	10	3	0
	K	11	31	-	16	14	8	0
	L	29	40	-	27	34	21	12
	M	36	47	-	37	41	29	29
	N	45	46	-	41	46	31	30

The units shown represent an experimental unit of changing magnetic field strength refered to as a Remar, meaning Remote Magnetic Response. The BH quantity of the field remains the same, but the Tortics yield Remars of intensity variation. Ordinarily this digital probe would be displaying amps DC on a single line conductor of a circuit.

Data is omitted from the 18:18 hours slot because the probe came lose from its cradle while hand rotating the cluster.

ing geomagnetic field also occur at or near the speed of light. This would peg their velocity of propagation at some 10,000 times faster than the P-Seismic waves. (7) The pre-seismic mechanism of energy conversion is presently unknown, but the natural occurrence of visible light in the air close to surface and prededing an earthquake as bravely witnessed by Yasui, is a clear indication of a wave form conversion. A magnetoelectric conversion is suspected, particularly when the earthquake lights occur over water.

Earth-tides, like sea tides, occur twice a day. It has been known for some time now that the gravity pull of the Moon also effects land masses. (8) Associations of earth-tide variations and earthquakes have only been hinted at without a comprehensive program to develop measuring devices and geomagnetic micropulse analyzers. Using magnetic levitation devices and principles of Tortic waves, found thus far, can be the basis of an earth-tide monitor. (See Figure 8: Suggested Earth-Tide Monitor) If such a monitor can be sensitized to read gap variations in micrometers, then the illusive geomagnetic micropulses will begin to show up considerably far ahead of P and S-Seismic waves which would register on a seismometer.

Magnetopause is a very sharp delineation between space and the outer reach of the Earth's magnetic field. The IYQS (International Years of the Quiet Sun), 1964 and 1965, which was an extension of IGY, pursued data to conclude that the Earth's magnetic field has a termination point or outer shell. (9) Sir Issac Newton's early studies with small magnets resulted in the same thing, but he called it the "Effluvia" of a magnet. (10) With subsequent space flights in the 1970's, the Earth has several layers or effluvic shells which decrease in intensity with each shell as the distance from the Earth's surface increases. As the Earth orbits the Sun, the Earth's magnetic field has extended field lines as momentum stretches the trailing edge of the field to form the "magnetic tail". (11) The tie point is that the properties between magnetic materials and fields which link and anti-link (or repel) are the same regardless of size, location and mediums traversed.

Another energy connection which needs to be investigated is the identification and study of the solar-magnetic potential. Solar light and radiant heat, which are currently being prescribed as our most economical renewable energy resource during daylight hours, is but a souvenir of a far larger energy resource from the Sun. By celestial standards, with the discovery that our Sun is a dwarf star with a G2 spectral class rating, one of the products of its massive fusion furnace is a dense solar gravity field capable of holding 9 known planets, their moons, and a vast assortment of asteriods within its grip. (12) The Solar Polar Probe, expected to be launched in 1986 with an ETA at the Sun in 1990, has a primary mission to obtain data on solar wind, the graviton flux from gravitational waves, particle emmissions and the structure of the solar magnetic field. The probe, which ought to be dubbed, "Close Encounters of a Hot Kind", will come within 3 solar radii (or 1,296,900mi) of the Sun's surface. The mission will hopefully conclude with an accurate measurement of the quadrupole moment of the solar gravitational field. (13)

Down-to-Earth Applications in Research

There are two prototype systems currently being developed by M.E.L. in basic energy research. The first unit is a solid state magnetic-to-electric converter which utilizes the dynamic flow of magnetic energy. A neutral pulse generator supplies a high current negative electrical pulse to a coil geometrically arranged within a core of field linking plumes. The magnetic core responds by throwing back a positive pulse. If a positive pulse is thrown into the core nothing comes back. These unipolar magnetic fields have no neutral as such and can only generate a neutral potential in a moving coil if the positive potential is present. This solid state unit has no moving parts

FIGURE 8 EARTH TIDE MONITOR 7TH ANNUAL UMR-DNR ENERGY CONFERENCE OCTOBER 1980

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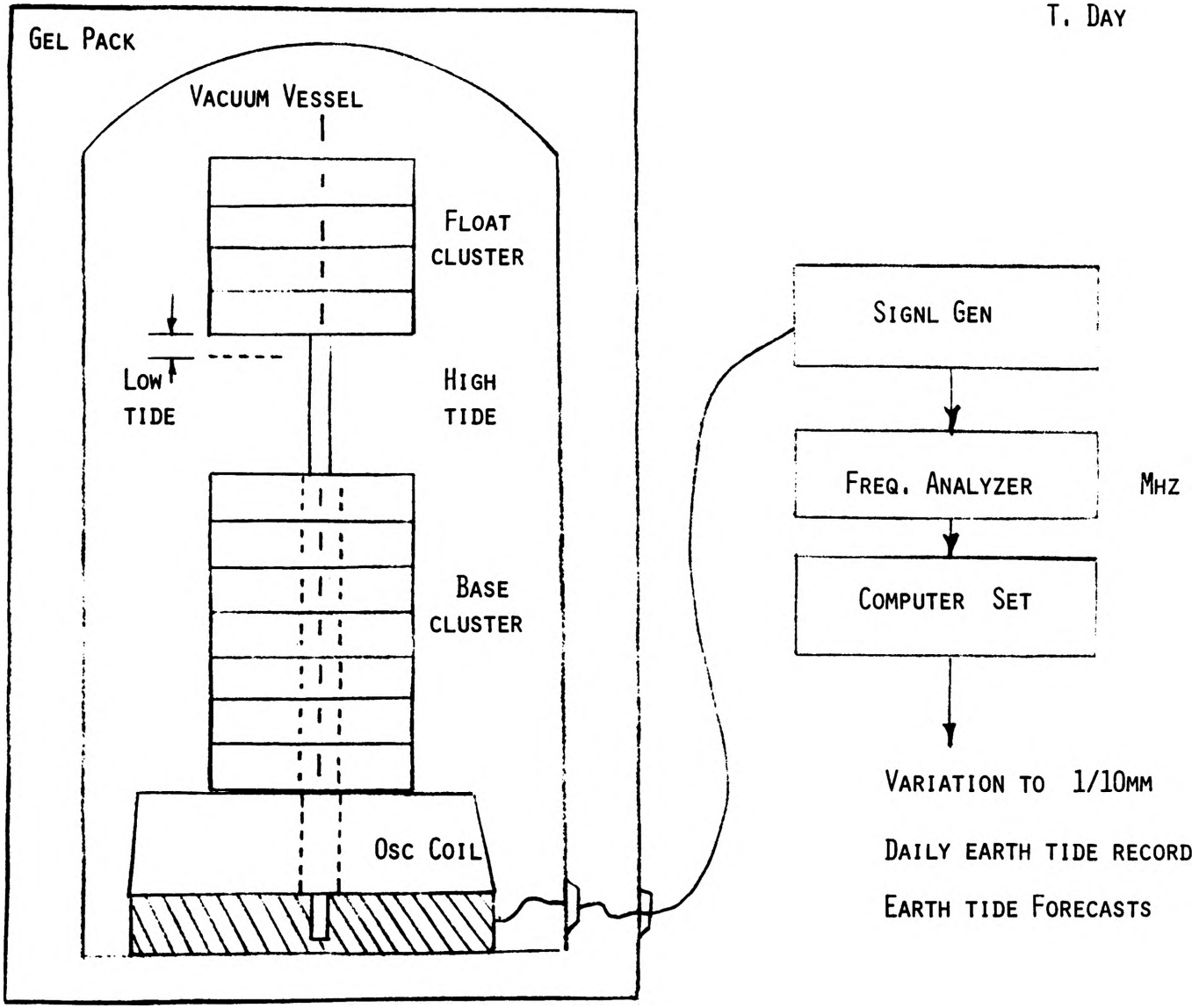

and through a series of SCR circuits a frequency of pulses is established. Conversion through an inverter produces a faint, very inefficient AC response. The magnets which make up the circular core will weaken according to the demand on the total system and will have to be "recharged" similar to a battery system at least twice a year to maintain the max(BH) as high as possible. The target cost is $800/Kw based upon 1979 dollars with a 10% inflation rate per year for replacement energy costs. This will maintain a competative cost per kWh over the service life of the unit. (See Figure 9: MED Magnetic Battery System)

The other unit is a traction motor device which converts magnetic field responses between ferromagnetic and diamagnetic structures into continuous torque for rotary motion. The momentum properties of magnetic fields coupled with the use of Bismuth, a good diamagnetic material and a field response amplifier can produce motion on a rotating member. A target cost of $156/BHP will have to be maintained in order to be competative with conventional designs of torque equipment. Problems with field geometry are presently keeping the project drifting in several directions searching for the right cluster spacing and rotor speed to initate the torque responses.

Conclusions

With the evidence that motion does exist within the conductance of magnetic energy, these new-found principles admittedly in their infancy, have existed as a natural phenomenon for magnetized bodies since the creation of time and matter. Many research activities have been born at M.E.L. to further explore the mysteries of magnetism. There is much work to be done in determining the wavelength of Tortic waves and the conversion mechanism of spiral waves to planar waves. The beauty of the smooth-lined magnetic plumes produced on CRT screens, the gradual, almost lazy movements of the Tortic waves, the rapid moving planar waves we have learned so much about, must somehow fit together. Are planar waves produced when spiral waves are streched beyond $2\pi A'$? Why do the spiral waves move so slowly? Why does a magnetic field exhibit momentum when the external field of a magnet has no measurable mass? The only intellegent conclusion that can be made about energy research is we have a long way to go from where we stand today and where we need to be tomorrow. The harder we work the more energy options we will produce and qualify. Some will fail, but some will pass.

In an effort to respond to OPECs control of Western foreign policy and the pervading economic devastation of decontrolling domestic petroleum prices, intellectualizing about the benifits of researching MED as a renewable energy resource is not enough--these MED devices must be pulled into reality as quickly as possible. We have two immediate problems: How do we educate our children to be creative in solving tomorrows energy resource problems and how can we de-educate our Federal government on its present course of self-strangulation? These answers must be found so that we energy researchers can place these new energy technologies into the hands of well trained, thinking human beings who respect the future as much as we do. Thank you.

FIGURE 9 MED MAGNETIC BATTERY SYSTEM

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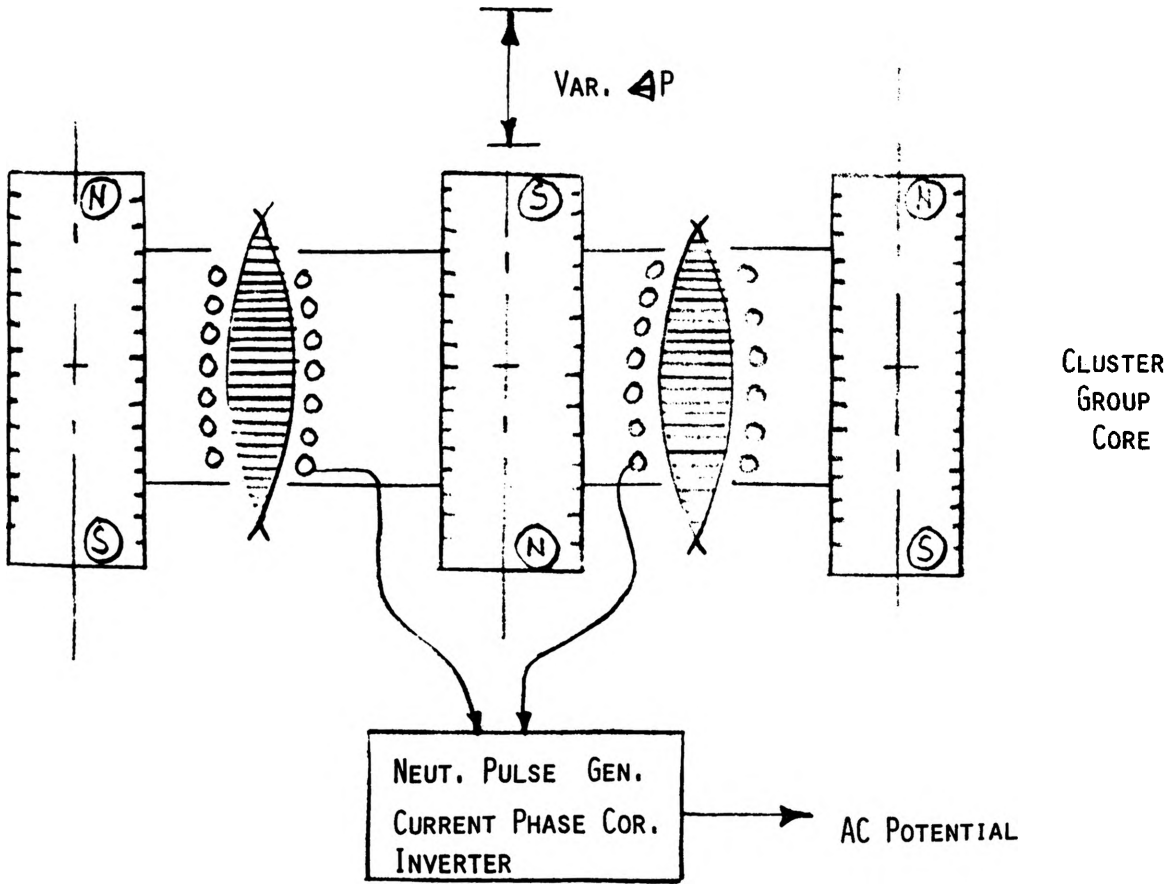

FIGURE 10 MED TRACTION MOTOR SYSTEM

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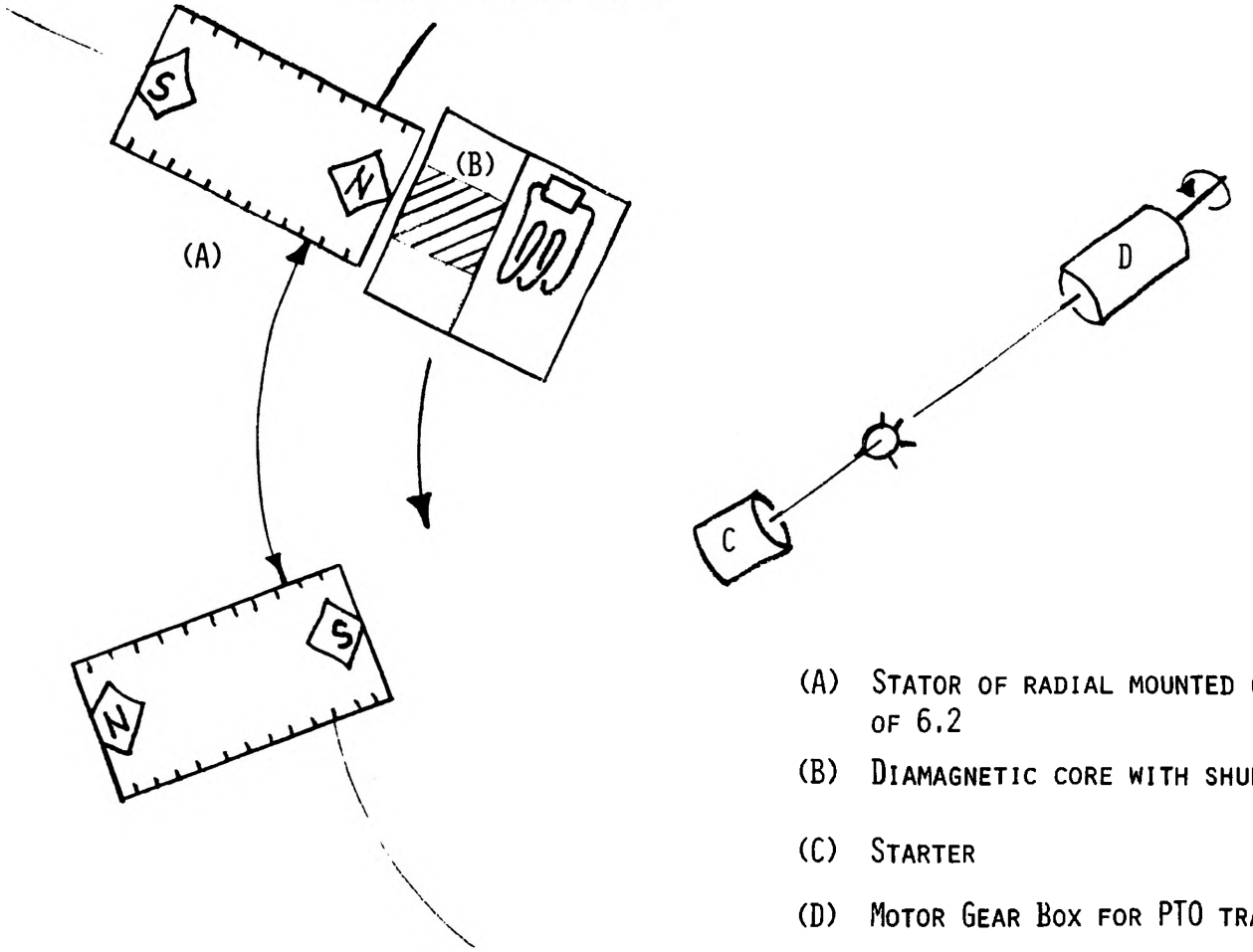

(A) STATOR OF RADIAL MOUNTED CLUSTERS OF R_A OF 6.2

(B) DIAMAGNETIC CORE WITH SHUNTED CORE TRANS COIL

(C) STARTER

(D) MOTOR GEAR BOX FOR PTO TRACTION OUTPUP

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