MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF ELECTRICAL ENGINEERING

Report No. 4

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PROGRESS REPORT TO THE DEPARTMENT COMMITTEE ON GRADUATE STUDY AND RESEARCH

SUBJECT OF RESEARCH: M. S. Thesis: A Co-Incident Current Magnetic Memory Unit

Period Covered by this Report: April 25 to May 18, 1950

Student Working on Research:

W. N. Papian

Building: Barta

Expected Date of Completion:

July 21, 1950

Supervisor: J. W. Forrester

Noted by:
Res. Lab. Office_____
Grad. Comm. _____
Supervisor_____

Detail of Work Currently Active: Cores made of the magnetic ferrites are being investigated in a qualitative way to sort out a number of cores which are satisfactory enough to be used for more careful testing.

Expected Date of Completion of this Detail: May 31, 1950

Statement of Progress Since Last Report: Include references, with statement of their usefullness.

After verifying that metallic core MTS 4382 would hold stored information despite repeated excitation by non-selecting pulses, that it had an extremely high one-to-zero read-out amplitude ratio, and that it could be switched in about 40 μs., it was laid aside temporarily in order to start tests on some recently received magnetic-ferrite cores.

Results for these cores are quite promising. In general, there is a dramatic decrease in response times to the order of a microsecond or so for flux reversals in response to magnetizing fields only slightly greater than H_c. One-to-zero read-out amplitude ratios are rather low (of the order of 3-to-1), partly because B-H characteristics are not

sufficiently rectangular, and partly because the flux-reversal output pulse comes at about the same time as the pulse due to the start of current flow through whatever inductance is presented by the core to small currents. Retention of stored information in the face of repeated non-selecting excitation is only fair, again because the B-H characteristics of the materials are not sufficiently rectangular.

Some experimental attempts were made to improve the B-H rectangularity by applying stress to some of the cores which had high magnetostriction coefficients. Substantial improvements were noted in two cases in response to drawstrap compression. These improvements were on cores whose B-H loops were among the least rectangular; unfortunately, the more "rectangular" cores, among the present batch of samples, appear to be less sensitive to stress.

The following table gives a qualitative comparison of the two general types of cores tested to date.

Core type	Response times	Information Retention	One-to-zero Signal Ratio
Metallic (high rectangularity and high conductivity)	Thirty microseconds to milliseconds.	Very poor to excellent	Good to Excellent
Ferritic (low rectangularity and very low conductivity)	One-half microsecond to microseconds	Very poor to fair	Very poor to poor

Expansion of Thesis:

In view of the highly promising results turned up so far in this investigation it has been decided to increase the size of this Thesis from 26 to 35 academic units. Permission to do so has been obtained from the Thesis Supervisor, Professor Caldwell and the Registration Officer.

Re-Estimated Division of Time:

a.	Preparation of proposal	55 hours
b.	Further study of the literature	35 hours
c.	Experimental work and analysis	275 hours
d.	Correlation of results and formulation of deductions and conclusions	60 hours
e.	Preparation of thesis report	100 hours
f.	Total	525 hours

Signed: William N. Papian
W. N. Papian

WNP:sst