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Memorandum M-2483

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Division 6 - Lincoln Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: TRIP TO RCA VICTOR, CAMDEN, OCTOBER 22, 1953

To: David R. Brown

From: Francis E. Vinal

Date: October 28, 1953

Abstract: Review of the progress in memory core production at RCA Victor in Camden is encouraging but considerable stabilization remains to be accomplished in the process, particularly in the pressing and firing operations. Particular care in testing sample batches should be directed toward checking reproducibility from batch to batch as their estimates are perhaps a bit optimistic about reproducibility.

The writer accompanied D. R. Brown and J. H. McGusker. We were joined in a discussion by the following RCA men: Mr. A. T. Harding, Mr. M. S. Rose, Mr. D. Koch, Mr. G. Hipskind, Mr. R. Beshgetoor and by Mr. R. Blessing of IBM. The morning discussion was devoted primarily to reviewing the progress RCA has made in the production of memory cores and estimating what production they might be reasonably expected to make in the near future. The placement of orders by IBM and delivery dates were discussed.

In the afternoon small groups were formed and individual matters of interest were discussed. It was at this time that Mr. Harding and Mr. Simpkins of RCA and the writer discussed the fabrication techniques for memory cores. RCA is having the usual difficulty regarding reproducibility of batches and although they are optimistic about being able to repeat the performance of any batch, I believe that they have more work to do before this can be assured. They have encountered a great many difficulties in pressing, primarily with the formation of cores with large voids. Their material flows very well into the dies and the reason for the voids is something of a mystery. Their Stokes Press is adjusted so that their pressing stroke is quite hard. I would estimate that the cores are being pressed at a pressure up to 100,000 psi. Their process techniques include experiments with both a gradual rise in furnace temperature and sudden insertion of cores into a hot furnace. Using the gradual rise technique the furnace is brought to a temperature and held for an hour. Following which the cores are removed and scraped from the setter plate onto a cold slab. Using the other approach, the binder is first removed by heating the cores at 500° or 600°F in a small oven or even by heating the setter slab with a Bunsen burner. The cores are then inserted into a hot furnace over a period of 3 to 5 minutes. This precaution is taken for the sake of the setter slab rather than the cores themselves. The setter slabs are mullite and the cores are set directly on them. After the high temperature period cores are quenched in the same manner as above. RCA has used firing temperatures ranging from 2050°F to

2250°F. They state that observable differences occur in the electrical properties of the cores with temperature variation of as little as $\pm 5^\circ\text{F}$.

Mr. Harding was very cooperative in discussing his process freely and left it to the discretion of the writer how such information should be handled to avoid embarrassment to RCA. I did not ask the exact composition of the RCA cores, but Mr. Harding stated that the composition was reasonably close to that recommended by Mr. Hegyi of RCA Princeton Laboratory in his article submitted to the Journal of Applied Physics for publication in November, 1953. Mr. Harding supplied the writer with a small vial of material, prepared for pressing with the binder incorporated, for our experimental use here.

A considerable portion of the discussion was devoted to binders. That which the RCA group is using is a product of the Hercules Powder Company marketed under the trade name of Flexalyn. They use 3% of this material according to the following procedure which was supplied by Mr. Simpkins.

"Using a Hobart food mixer weigh oxides and add 3% of this weight. Flexalyn dispersed in methyl ethyl Ketone and enough solvent to bring the consistency to that of cake batter. While stirring, evaporate solvent until consistency is that of bread dough."

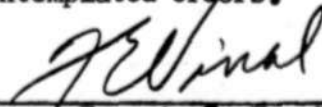
"Mill rolls (Thropp) differential speed. Clearance between rolls .003" - .005". Mill the mass. As solvent is evaporated the ferrite will flake off."

"Reduce particle size of flakes to desired distribution."

Ferrite material, after the binder is incorporated, is crushed and to yield the size fraction necessary. For the Stokes Press this is 100 to 150 mesh or possibly 100 to 200 mesh. From materials crushed without special procedure the yield of this fraction is about 10%. However, they have found that they can considerably increase this yield by adding small grinding balls to the screens of larger mesh size than the fraction desired. These grinding balls break up a considerable amount of material which would otherwise be retained on a larger mesh screen and result in a yield of 40% of the desired size fraction.

It is apparent that RCA has made considerable progress in the fabrication of memory cores, but it is the writer's estimate that it will be six months before they have their process sufficiently stabilized to produce uniform cores in the numbers called for in contemplated orders.

Signed



Francis E. Vinal

Approved



David R. Brown

FEV/djd

cc J. W. Forrester
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