

~~SECRET~~

The Files (R&D Laboratory)

30 March 1959

██████████

Trip Report - 1959 IRE Convention

1. The 1959 IRE Convention was attended by ██████████ on March 23 and March 24. The following paragraphs include brief summaries of the lecture sessions attended and descriptions of interesting exhibits seen during the convention.

2. Lecture Sessions

(a) The Field Effect Tetrode

Mr. H. A. Stone, Jr. of Bell Telephone Labs described the development of a new four-terminal field effect semiconductor device which, in addition to being an improved field effect transistor, also exhibits several interesting and useful properties. The principal feature of the field effect tetrode is that it utilizes two opposing channels, each of which serves as a gating element for the other. The two channels are etched in very thin "p" and "n" regions separated by a single diffused junction. Two contacts are made to each region, thus providing a four-terminal arrangement. The two contacts in each region are located in such a manner that when the diffused junction is reverse-biased, the channels in the two regions are in parallel.

The field effect tetrode can be used in either a two-terminal or four-terminal arrangement. As a two-terminal device, the field effect tetrode exhibits the property of stable negative resistance over a large portion of its operating range. In the four-terminal configuration, the device acts as an impedance inverter. For example, a small inductive reactance presented at the input terminals will appear as a large capacitive reactance at the output terminals.

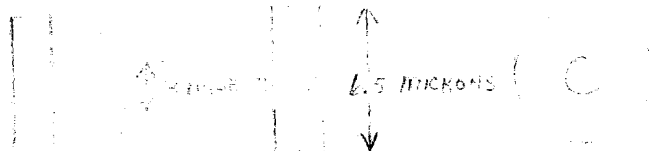
~~SECRET~~

- 2 -

Mr. Stone was quick to point out that the field effect tetrode is still in the early experimental stage and that many problems will undoubtedly arise in the production of the device. The cost of the method used in producing the laboratory model would be prohibitive from a production standpoint. Mr. Stone hoped that some of the newest transistor techniques could be utilized to speed the field effect tetrode into the production stage.

(b) The Tecnetron

A brief discussion of the theory of the Tecnetron was given by Mr. A. V. J. Martin of Carnegie Institute. Mr. Martin's lecture was confined mainly to a mathematical analysis of the theoretical properties of the semiconductor device. The amplifying properties of the Tecnetron are produced by the centripetal action of the field effect on a cylindrical surface. The semiconductor element of the Tecnetron is shaped as shown in the sketch below:



The dimensions shown were given as typical, but the analysis showed that the properties of the device, such as cold resistance, conductance, and cutoff characteristics, are largely dependent on the size of the neck or small portion of the semiconductor element. One metal rectifying contact is made to the element. The mathematical analysis showed the theoretical frequency limit to be in the vicinity of 600 mc. According to Mr. Martin, the Tecnetron has been used successfully at frequencies as high as 350 mc.

3. Exhibits

(a) Rechargeable Batteries

A variety of rechargeable nickel-cadmium batteries, ranging in capacity from 0.5 ampere-hours to 150 ampere-hours, were exhibited by Gould-National Batteries Inc. A Gould Nicad Type ACTL11W 5 ampere-hour battery was demonstrated at temperature extremes of -45°F and $+212^{\circ}\text{F}$. The batteries were shown to deliver 700 ma at rated voltage at these extremes.

- 3 -

Yardney Electric Corporation displayed a number of its "Silcad" rechargeable cells which claim the advantage of greatly reduced size and weight over other cells of equal capacity.

(b) Transistor Circuit Protector

Electronic Research Associates Inc. displayed an over-voltage, over-current electronic limit relay for use with transistor power supplies. The unit connects between the power supply and load, and provides over-voltage and short-circuit current protection for both the transistor power supply and the connected circuits. The over-voltage adjustment range is 5-50 VDC and the current limit range is 100 ma to 1 ampere. The response time of the unit is in the order of several micro-seconds.

(c) Printed-Circuit Motor

A printed-circuit motor armature was displayed at the Photocircuits Corporation exhibition booth. Motors using the new printed-circuit armature technique are now available from Printed Motors Inc. in a wide range of horsepower. Some of the more revolutionary features of the motor include very low armature inertia, high-temperature operation, low impedance (suitable for power-transistor operation), and almost negligible armature reactance. Weight reduction would certainly be a highly desirable feature.

(a) Noise and Field Intensity Meter

Empire Devices Products Corporation displayed a new noise and field intensity meter for the 1-10 kmc range. Additional information on the unit was requested and will be sent to the Lab.

Lab/TMY/jcm (30 March 1959)

Distribution: 1 - Addressee
2 - Monthly Report ✓
1 - R&D Chrono