Transistors in 1923 ????

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Recent receipt of a brochure describing some newly-developed double based silicon transistors recalled some experiments of thirty-odd years ago involving biased silicon crystal detectors, and the occasionally spectacular performance of some of them. These tests were conducted by a large number of radio (we called it "wireless" then) experimenters in and around Montclair, N. J. who swapped notes back and forth regarding the relative merits of galena and radiocite; the vibrating interrupter vs. the electrolytic interrupter; why the Marconi magnetic detector would not work on phone; and similar esoteric subjects now relegated to limbo.

Two of these circuits sometimes performed much better than the currently-available audions, which were Tungar bulb sized, and had a spare filament lead, to be connected when the first filament gave up the ghost. These cost about two months' paper route money, if I remember correctly, and ran dry cells down like nobody's business.

The first of these circuits, sketched from memory, in fig. 1, used two catwhiskers. One connected to the tuning coil, which was of the "two slide" variety, wound on a Quaker Oats box, and thoroughly shellacked to keep out moisture. Catwhiskers were usually steel phonograph needles, and very heavy pressure was needed to get the desired signal strength. Sometimes a carborundum crystal was used as a catwhisker, in which case even heavier pressure was needed, and a high bias voltage, such as 15 (ten dry cells, or two weeks' lunch money!!). Even with this heavy pressure, the "sensitive spot" was somewhat elusive, requiring up to two hours of hunting before it was found. When found, the sensitive spots remained useful for only a relatively short time, and the catwhisker was easily jarred to a "dead" position. Because of the high pressures involved, the zone of contact between the catwhisker and the silicon crystal was sometimes crushed into a gray powder at about the time that the sensitive spot got really "hot."

[*Continued on page 115*]

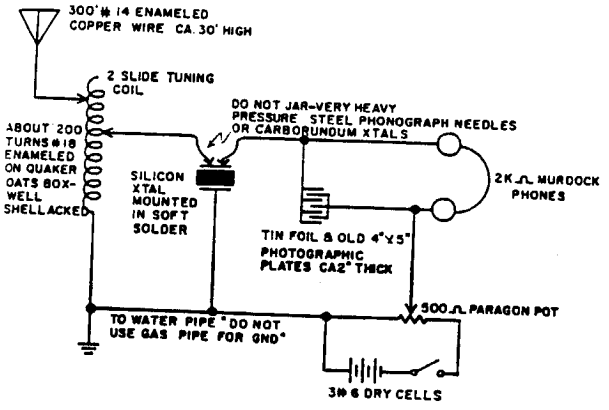

Fig. 1—Double catwhisker biased silicon detector.

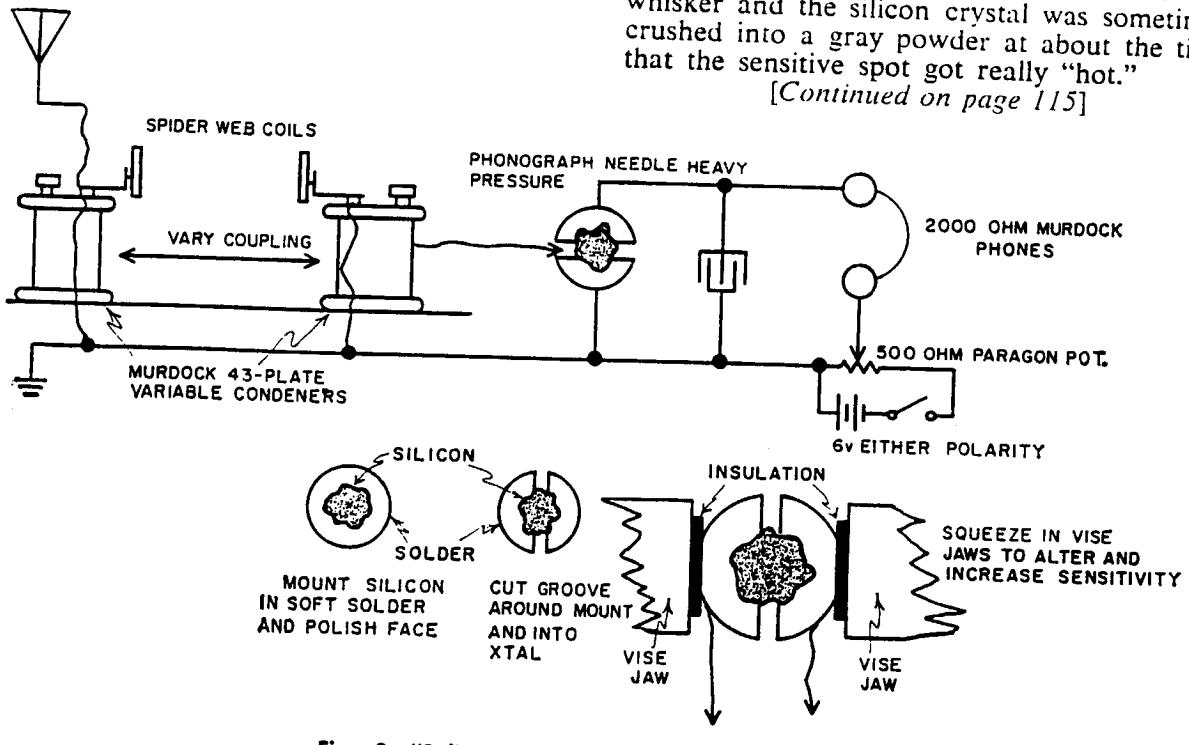

Fig. 2—"Split Crystal" biased silicon detector.

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The second circuit, sketched from memory in fig. 2, was somewhat more advanced than the first, and performed more consistently. This employed a silicon crystal which was mounted in soft solder, and then carefully grooved, so that the crystal was supported by two blobs of solder. Bias of either polarity was applied across the two solder mountings, and the catwhisker was usually a steel phonograph needle, pressed firmly into the face of the silicon crystal.

Performance of this detector, on occasion, was rather remarkable. It would receive more signals than any other tested at the time, and the apparent tone of the signals could be changed by altering the bias, or by applying heavy transverse pressure (with a vise) to the crystal. If memory serves right, the most sensitive point was reached just before the crystal shattered under pressure. Silicon crystals mounted in brass (probably low-melting hard solder) worked slightly better than those mounted in soft solder; but mounting in either Wood's metal or pure tin had no effect on the performance.

Constructional details of the time included the use of red fiber spiderweb coil forms (black was no good for some reason); the coils had to be wound with green Litz wire (no other color would do); and they had to be boiled in Parowax after completion, or they would not work! The phone bypass condenser was customarily made from florist's tinfoil and cleaned photographic plates; but a few heretics found that parts of the tinfoil and wax paper condensers included in Model T Ford coils, which were also a good source of #40 wire for loading coils, worked just as well.

Experiments with biased silicon detectors, and similar crystal devices, ceased about 1924, as various telephone repeater tubes were "liberated" into amateur hands. Widely adopted was the "blooper" receiver, often consisting of a regenerative detector (Colpitts, Hartley, Flewelling, etc.) and three stages of audio.

This brief excursion into the dim historical recesses of the wireless art raises a very interesting question. Did a large group of radio amateurs and experimenters, about 1923, develop and use a crude form of transistor, and unknowingly fumble the ball, so that the official discovery of transistors, by staff members of the Bell Telephone Laboratories, was delayed by perhaps twenty years? ■