

## ENGINEERING

# Find Transistor Rival

**An electronic device that may rival the transistor has been developed. The tunnel diode, as it is called, is extremely small and resists nuclear radiation effects.**

TINY ELECTRICAL charges tunneling furiously through silicon, germanium and compounds of gallium and indium have given birth to an electronic device that may rival the transistor.

The "tunnel diode" ultimately may replace the revolutionary transistor as the "wonder boy" in radios the size of wrist-watches, in fast-working computers, and in controls for nuclear reactors.

First reported in 1958 by Leo Esaki, a Japanese scientist, the tunnel diode has been improved by physicists at General Electric Company's Research Laboratories in Schenectady. Limited quantities are now being made available to industry for experimentation, Dr. Guy Suits, vice president of research, has announced.

The tunnel diode is so small that a radio transmitter the size of a 50-cent piece was built with it, including battery. The radio successfully transmitted to an FM receiver nearby. The tunnel diode itself is dwarfed by a paper clip.

In contrast to other devices with similar switching and amplifying abilities, the tunnel diode works at the speed of light. The high speeds at which electrical charges

travel in the tunnel diode will enable scientists to achieve electronic frequencies higher than 10,000 megacycles. Oscillation frequencies higher than 2,000 megacycles already have been achieved, the company reported, matching the performance of the most advanced transistor now available.

One special virtue of the tunnel diode is its ability to resist the damaging effects of nuclear radiation. In this respect, it outranks transistors 1,000 to one. It also is little affected by environmental conditions. Silicon tunnel diodes have worked at temperatures of 650 degrees Fahrenheit. Conventional silicon diodes fail at about 400 degrees.

In addition to being smaller than the transistor, the tunnel diode requires only one-millionth of a watt's power. Transistors require about one-thousandth of a watt, and a conventional triode radio tube needs about one-tenth of a watt to work.

Developed at the Laboratories by Dr. Jerome J. Tiemann and Robert N. Hall, the device has one curious electric quirk: as the voltage applied across the tunnel diode increases, the transmitted current drops.

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lowering the blood pressure of all the patients and was well tolerated by all, producing no adverse side effects.

The drug appears to be a potent diuretic (a substance that increases the secretion of urine) as well as an antihypertensive agent, the doctors report. Its main action is to cause loss of sodium and chloride through the urine.

This probably keeps the patient on a low-salt diet despite a general food intake. It has been shown that severe sodium restriction alone will lower blood pressure. Because restriction is extremely difficult outside the hospital, however, hydrochlorothiazide treatment may help control the salt balance.

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## MEDICINE

# Treat Circulatory Ills

**Three drugs, one an anticoagulant, the others antihypertensive drugs, are expected to be an important aid in treating various diseases of the circulatory system.**

THREE COMPATIVELY new drugs that may be used in the treatment of circulatory ailments are described in the *Journal of the American Medical Association* (July 11).

One is an anticoagulant, used to dissolve or prevent blood clots. The other two are antihypertensive drugs, for treating high blood pressure.

The anticoagulant is a coumarin derivative known as Liquamar. Its therapeutic action is 10 to 25 times that of its parent substances, according to Drs. Herman Gold and George W. Lilley of Chester Hospital, Chester, Pa.

The doctors report giving short-term treatment with Liquamar to 111 patients hospitalized with acute vascular diseases with which blood clots are associated. Slower blood clotting times were observed within 42 hours in 77% of the patients. The doctors conclude that the drug, which has been extensively studied in Europe, causes satisfactory slowing of blood clotting

during short-term treatment of blood-clotting disease states.

Daily prothrombin time tests were made. This, the doctors report, offers maximum protection with a minimum risk of bleeding complications found in a state of drug-induced hypocoagulability. Seventy-one of the patients were male, 40 were female.

One of the two antihypertensive drugs, guanethidine, is reported by Drs. Irvine H. Page and Harriet P. Dustan of Cleveland to be different in basic chemical structure and action than other drugs used in the high blood pressure therapy.

Treatment of 18 hypertensive patients with guanethidine caused a slow but prolonged fall in arterial blood pressure.

The third drug is described by Drs. Victor Vertes and Mervyn Sopher, also of Cleveland.

Known as hydrochlorothiazide, it was given to ten patients with high blood pressure of unknown cause. It succeeded in