engineering sciences

AVIATION

Electrocuting noise

The idea of electrifying an aircraft's jet flame to cancel out the plane's noise has been around for awhile (SN: 1/13/68, p. 43), but a problem has been the low temperature of the jet flame. Pennsylvania State University's Dr. Gerhard Reethof's solution is to seed extra ions into it so that it has sufficient conductivity (ion density).

First the jet flame is electrified with an oscillating voltage, then the ions are added. The ions colliding with the gas molecules in the flame could create a pure tone with the same intensity (at a particular radius) in all directions. The trick then would be to get the pure tone pitched exactly out of phase with the fan blade noise so the two cancel each other, like ripples in a pond. What makes the idea possible is that the fan-blades' sound is also a pure tone, thus permitting acoustic cancellation.

At present, Dr. Reethof is working in an anechoic chamber on a flame five inches long and one inch wide.

AUTOMOBILES

Eyes in the back

Anyone who has backed over a bicycle in a driveway knows how difficult it is to see small objects behind or under the rear bumper.

A laser warning system to alert drivers to objects, children or pets 10 feet to the rear has been designed by a group of engineers led by J. F. Ziomek of the Ford Motor Co. The system consists of a transmitter under the bumper on one side and a receiver under the bumper on the other. It covers the crucial area one to ten feet back and six inches to one foot above the ground.

The system is activated by the ignition switch and can operate in reverse, park and neutral. The laser transmitter emits a thin infrared beam, which is spread out by a lens system but not beyond the width of the car. If the beam strikes an object it bounces back and is picked up by the receiver. A warning buzzer sounds and a lamp on the dashboard lights up. The system is deactivated if the object moves out of range, the gears are shifted, or the ignition turned off.

SPECTROSCOPY

Narrowing the energy spread

In order to get good resolution in electron spectroscopy to determine atomic and molecular structure, it is important to have a source of electrons with a narrow energy spread. The more variation there is in the energy of the individual electrons in the beam, the less likely they are to pick up minute details.

Scientists at the Marchwood Laboratories of the Central Electricity Generating Board in Southampton, England, have developed a device which does just this in the range from 5 to 50 electron volts. It employs a high electron flux of up to several hundred amperes in this range, which makes it a high intensity beam.

Keystone of the device is a double sheath and a constriction which the discharge current has to cross. When the electrons jump across the double sheath, they lose energy. The amount lost can be varied by changing the size of the constriction, the pressure or the current and thereby keep the electrons in a narrow energy band. Once they are across the sheath, they excite, dissociate or ionize atoms or molecules to produce the high intensity beam.

SEMICONDUCTORS

Dual diodes

Two different types of semiconductor diodes have been developed in Japan: one by the Matsushita Electrical Co. of Osaka and the other by Prof. Junichi Nishizawa of Tokoku University in Sendai.

The chief feature of the Matsushita diode is that it is extremely sensitive to pressure; a slight touch enables it to regulate current flow over a large range. Reported to be more sensitive than similar devices now existing, it is being considered for such applications as contactless light switches, record player needles and microphones.

Prof. Nishizawa's diode can oscillate at frequencies as high as 134 gigahertz. This means that greater use can be made of the once-neglected millimeter and submillimeter wave range.

RADIOGRAPHY

Portable atomic camera

Neutron radiography works on the same principle as X-rays, but X-rays are all stopped by dense objects, and neutrons are not. Some pass right through, others are partially absorbed and still others are completely stopped. The result is a shadow picture with varying gradations of lighter and darker areas, corresponding to such things as impurities, nonuniform concentrations of matter and cracks, or spaces.

Using this principle, John L. Cason of Battelle Northwest, Richland, Wash., has developed a 100-pound portable camera that can be wheeled to the subject. Present neutron radiographic devices must have the subject brought to them. His neutron source is 268 micrograms of the isotope californium 252.

NUCLEAR REACTORS

Number one for India

Despite political problems and a technical manpower shortage, India has been determined to achieve a nuclear technology (SN: 6/21, p. 603). A big step toward that goal has been taken with the completion of its first nuclear power plant. It was also the first to be built in a developing country, reports the U. S. Atomic Energy Commission, which supplied $100 million worth of enriched uranium for the 400-megawatt plant. It was built by General Electric and has two boiling water reactors and two steam turbine generators.

The two reactors require 80 tons of enriched uranium for a two-year period, but once the technology of using plutonium is perfected, the plant can switch and reduce the need for importing enriched uranium. The plutonium could come from spent fuel assemblies, and eventually from breeder reactors. The plant is located at Tarapur, 65 miles from Bombay.