Palladium Telephone Contacts

A NEW SERIES OF MINIATURE WIRE SPRING RELAYS

Relays have been called the building blocks of telephone systems, and in spite of the liberal use of semiconductor devices in the exchanges now building, very large numbers are still needed both for circuit functions as well as for making connections to existing equipment.

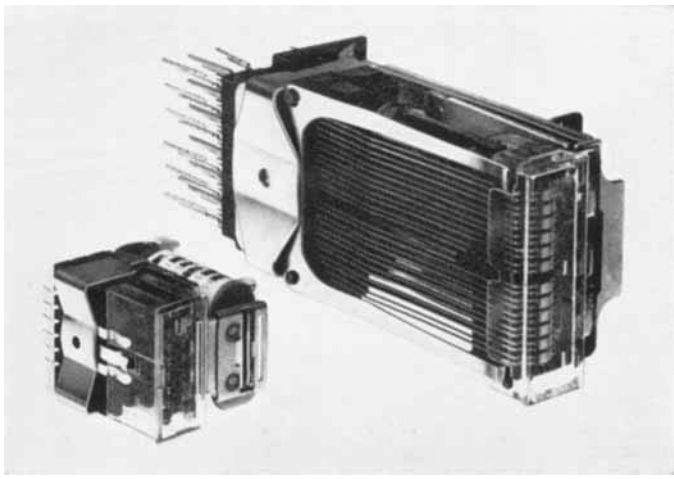
The relays for the central offices of the future will, however, need to be smaller than in the past—not only on account of the increasing pressure on space in telephone plant but especially so that they may be suitable for mounting on the printed wiring boards which carry the small diodes and transistors.

To meet these demands a new family of miniature wire spring relays has been designed by the Bell Telephone System and the Western Electric Company of America. Their development and characteristics are described by C. B. Brown (*Bell System Technical J.*, 1967, **46**, (1), 117–147), who provides a fascinating account of the efficient way in which the many special requirements have been fulfilled. The method of ensuring constancy of contact pressure, independent of inevitable variations in the angle between the spring wires during assembly, is particularly noteworthy.

In choosing a contact material the long experience of the telephone industry in the use of all the common contact materials in many shapes and sizes was available, and provided firm evidence that palladium has always given the best all-round performance in their switching devices. It has further been established that a thin layer of gold on one only of each set of opposing contacts is completely effective in suppressing polymerisation effects.

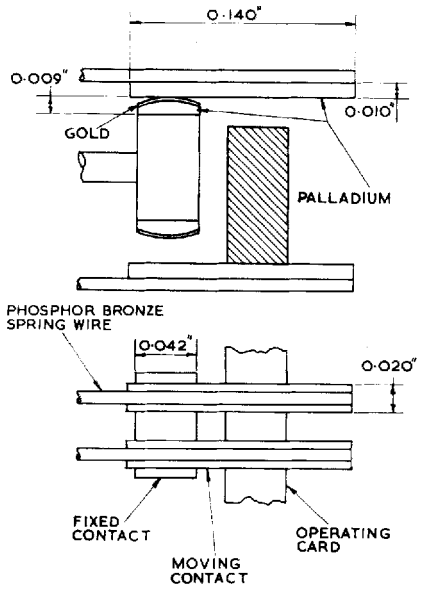
The detailed design of the contacts is shown in the diagram. Each circuit is controlled by two independent spring-supported movable contacts operating as a pair against one fixed contact. With twin contacts the risk of "open circuit" failure is virtually negligible. The fixed contact is formed with a cylindrical surface to reduce the possibility of dust particles lodging between the operating faces and is made from a sandwich material. This has a nickel core coated on each side with palladium with thin outer layers of gold. At the centre, the combined thickness of palladium and gold amounts to 0.009 inch.

The movable contacts are made from solid palladium strips, 0.020 inch wide and 0.010



The small size of the new miniature wire spring relay designed by Bell Telephone Laboratories can be appreciated by comparison with the established type of older wire spring relay

The contact arrangement in the miniature wire spring relay



inch thick, welded longitudinally to the phosphor-bronze spring wires.

Adjustment and maintenance of the contact assemblies have been made simple and straightforward and the contacts are readily cleaned by moving a strip of lint-free parchment paper, moistened with a solvent, between the surfaces.

With a non-inductive load or with proper protection on inductive loads, the life of these contacts is confidently expected to be equal to or greater than the mechanical life of the relay—at least 200 million operations.

J. C. C.

Ultra-pure Hydrogen from Water

AN ELECTROLYTIC DIFFUSION CELL

Hydrogen of high purity is frequently needed for specialised laboratory processes where the total demand does not justify the installation of hydrogen cylinders, thermal diffusion cells and their associated control gear.

Such requirements, it was suggested by A. S. Darling in 1963 (*Platinum Metals Rev.*, 1963, 7, 126), might well be satisfied by the use of small electrolytic diffusion cells fitted with silver-palladium alloy cathodes. Metals Research Limited, of Cambridge, have now engineered such a self-contained portable electrolytic cell, known as the GASPAK-H, based on Johnson Matthey's British Patent 973,810.

In developing a commercial unit from the laboratory prototype, numerous improvements have been introduced. The cell is thermostatically controlled and the cathode is an assembly of silver-palladium tubes. An internal de-ioniser protects the cell itself from water-borne contamination and fully automatic pressure switches, level controls and safety devices make it suitable for permanent connection, if required, to water and electrical supplies.

The GASPAK sits comfortably on any bench and will produce up to 150 ml per minute of hydrogen at pressures up to 100 p.s.i. When operated as a portable unit its reserve capacity of two litres of water permits five days' continuous operation at full capacity. Its controlled output is very suitable for gas chromatography, small sintering furnaces, or for hydrogenation experiments in organic chemistry.

The portable electrolytic hydrogen generator developed by Metals Research Limited