The influence of various treatments on the hardness of cladded materials is shown in Figure 7. Values measured both on the base metal and on the platinum cladding are given. The scatter is considerable and this may be due to inhomogeneity of the material and to the small testing load (0.5 N), which was necessary because of the thinness of the sheets. No relationship could be established between hardness and the quality of the cladding.

In this first part of our investigations on cladding with platinum and platinum alloys, it has been shown that certain base materials, such as copper-nickel alloys, are more suitable than others, such as pure copper. A later paper will report the second part of our investigations, which are concerned with the diffusion of the clad and base metal constituents into each other, and the occurrence of very pronounced hole-formation in the diffusion zone. This Kirkendall effect causes severe adhesion problems and may result in separation of the cladding and the base during later annealing steps. Therefore special precautions have to be taken to overcome this disadvantage.

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Barium Ruthenate Thin Film Resistor

ADVANTAGES FOR HIGH SPEED THERMAL PRINTING

Thermal printing is widely used for terminal outputs, facsimile receivers, and other applications in office equipment, as well as for laboratory and industrial recording instruments. Thermal printers are small, relatively simple, and quiet by comparison with impact devices. The working components of these thermal dot matrix printers are their heads which must have long life and be capable of rapid heating and cooling, so as to allow fast operation. High resolution is required to yield a dense dot pattern, of say 16 dots per millimetre, that is necessary for the printed lines to appear continuous. The heads are made of an alumina substrate on which several patterned layers are physically deposited. These consist of a glaze, the resistor element, an electrical conductor, and an abrasion resistant overcoat. The layers have a total thickness of less than 100μm. Driver circuits apply current pulses to the resistors, which in turn apply the desired pattern to the recording paper with which the head is in continuous contact.

A barium ruthenate thin film resistor has been developed by O. Takikawa, H. Hiraki, M. Harata, and T. Saito of the Toshiba Corporation, Research and Development Centre, Kanagawa, Japan, and a report of their work was presented at the IEEE 36th Electronic Components Conference on 5th–7th May 1986, in Seattle, Washington. The resistor was deposited by r.f. sputtering using a barium ruthenate ceramic target, followed by thermal annealing. Prototype printing heads were fabricated with a barium ruthenate film thickness of 50nm and a 2μm alumina abrasion resistant layer.

An advantage of barium ruthenate is its high resistivity, which results in a resistance of 1,000 ohms per dot and allows the necessary printing temperatures of about 370°C to be achieved with little power, that is 0.25 watt per dot. In addition it has high oxidation stability, thereby permitting the wear resistant alumina layer used on the barium ruthenate to be thin, which in turn facilitates the conduction of heat. Life tests with 2 ms pulses showed the resistor to have nearly constant electrical properties for at least 10^8 operations, which is a practical life requirement. The authors believe that this new material will be used commercially in thermal printing. M.A.