Production of Ferrite Memory Cores

PLATINUM GAUZE BELTS IN SINTERING FURNACES

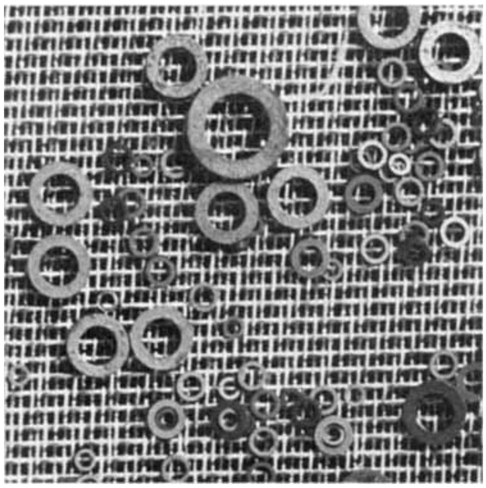
The growth of the computer industry has led to vast numbers of ferrite cores being manufactured to store information. Even a desk-top computer may contain 16,000 or more of the tiny ring-shaped cores, which are threaded on to the wires that control the write-in, storage or read-out of the single piece of information stored on each core.

Most ferrite cores are about 0.015 to 0.018 inch outside diameter (o.d.), although some now range down to 0.007 inch o.d. and 0.004 inch inside diameter (i.d.). Cores 0.080 inch o.d. and 0.050 inch i.d. are now considered large. Ferrite powders are made from combinations of materials which have been calcined to form oxides. The powders of controlled purity and particle size are mixed with a plastic, rolled out into tape or sheet, and are stamped or pressed to produce the core shapes.

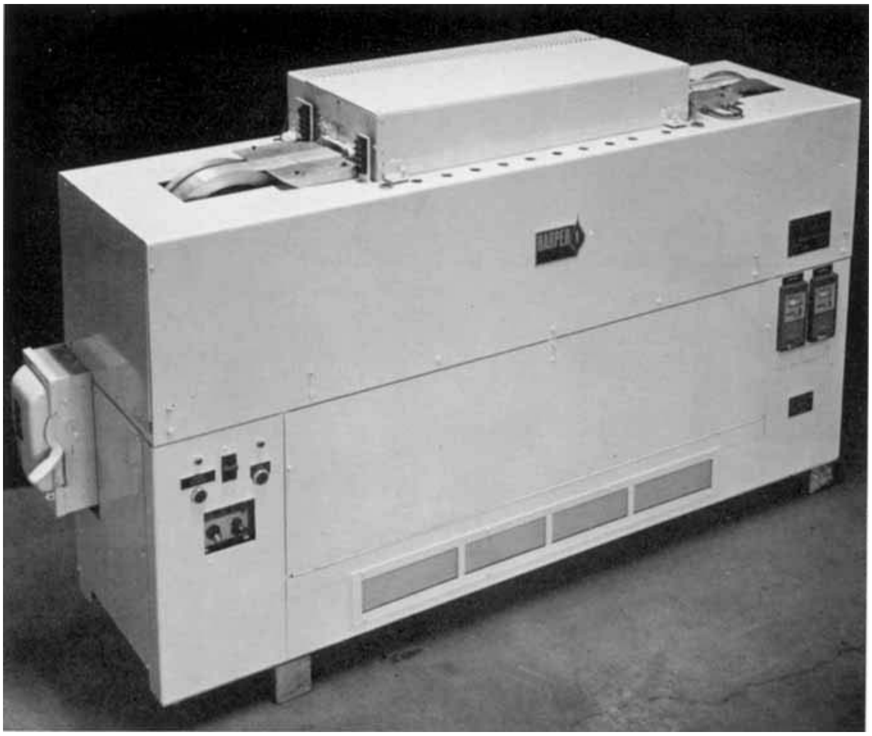
Core durability is ensured by subjecting the core shapes to a sintering procedure at up to 1500°C in a controlled atmosphere furnace. Originally a train of ceramic trays was used to carry the cores through the furnace but quick cooling after emergence from the furnace led to frequent breakages and high losses of cores. Heat-resistant platinum alloy trays were substituted for ceramic trays but they tended to warp in service and block the furnace exit. Next endless belts of platinum alloy foil were tried. Platinum alloy foil withstood the temperatures without warping, it did not contaminate the cores and the automated system increased productivity. However, cores tended to stick to the foil surface and then either to fall off as the belt doubled back or to re-enter the furnace and suffer from a second heating cycle.

Engineers at Matthey Bishop Inc., Malvern, Pennsylvania have now solved this problem by replacing the platinum alloy foil with a 10 per cent rhodium-platinum gauze belt. The belts have less mass than previous systems and thus encourage more even temperatures and faster firing. Furthermore, the weave improves gas circulation. Adherence of cores to the belts is no longer a problem because of the minute contact areas. These advantages have reduced core rejections. In addition, the belts are more flexible and so last longer.

The endless belts are 19 to 22 feet long, depending on furnace size, and up to five inches wide. They are driven by 12 inch pulleys, which eliminate sharp radii that might overstress the belts. Two weaves are



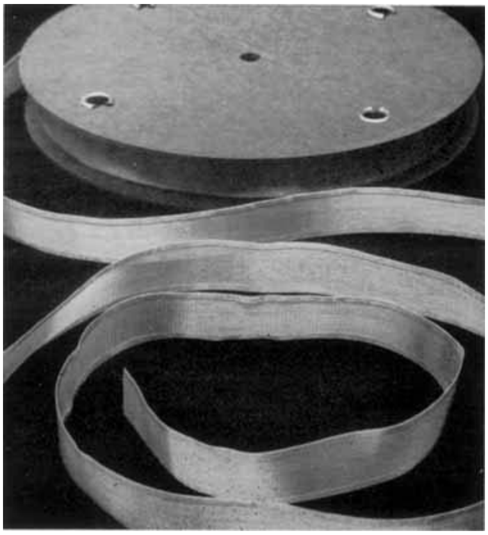
Ferrite memory cores on the 10 per cent rhodium-platinum gauze belt. The largest cores have outside diameters of only 0.080 inch. One square inch of the belt contains 75 warp wires and 150 cross wires. Wire curvature and the apertures provide minimum contact and good circulation of gas



A Harper electric furnace for sintering ferrite cores. The platinum alloy belt can be seen passing over the pulleys at each end of the furnace section. The belt is made endless by weaving the warp wires or by hammer welding

produced. The heavier belt for larger cores has a warp of 60 wires per inch of 0.008 inch wire and 75 cross wires per inch of 0.005 inch wire. The apertures are 0.0083 inch × 0.0087 inch. The lighter weave for small cores has a warp of 75 wires per inch of 0.005 inch wire and 150 cross wires per inch of 0.003 inch diameter, giving apertures of only 0.0037 inch × 0.0083 inch.

Such belts are gaining increasing acceptance as their advantages of better cores, higher production, reduced losses, and easier maintenance become more widely appreciated by ferrite core manufacturers.



A reel with a belt of rhodium-platinum gauze produced by Matthey Bishop Inc. Belts up to 5 inches wide are made. Belt length depends upon furnace dimensions. The gauze can withstand the process temperature of up to 1500°C without deformation, core contamination or core adherence