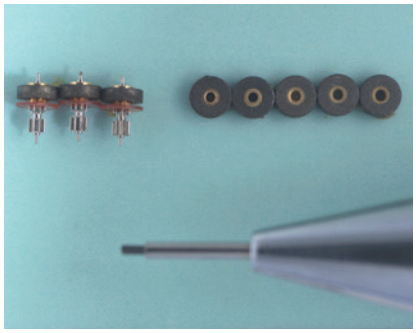
EPSON

SAM-D

1970



Product Features

The SAM-D samarium-cobalt rare-earth bonded magnet became the progenitor of Epson's* magnet business. Developed in 1970 as a rotor magnet for stepping motors used in quartz wristwatches, this rare-earth bonded magnet offered good dimensional accuracy and great flexibility in shaping. A structurally strong magnet that cost less than the sintered magnets that ruled the day, this bonded magnet became a highly welcome component in applications needing a compact yet powerful magnet.

Magnets used in small, confined spaces such as those found in a quartz watch require outstanding magnetic characteristics and workability. Existing compounds of cobalt and a rare-earth element such as samarium were acknowledged to have excellent magnetic characteristics, but they were also hard and brittle. To solve this problem, Epson researchers worked to develop a new powder-bonding method, one that would use a resin to bond together the powdered samarium and cobalt particles when they were compacted, to provide the proper degree of flexibility and strength between the powder particles. What these researchers came up with was the SAM-D, a $SmCo_5$ bonded magnet with both outstanding magnetic properties and workability.

The SAM-D could be formed along with other components, thus allowing metal parts to be worked at the same time the magnet was formed for a rotor. Since the SAM-D could be accurately produced in high volume, Epson was able to reduce the cost of materials to only about one-twentieth (as a ratio of volume) that of platinum-cobalt powder while maintaining essentially the same performance. The SAM-D was thus a significant factor in lowering the costs of a quartz watch.

Background

In December 1969, Epson became the world's first company to successfully commercialize a quartz watch. The internal development of materials in the course of the quartz watch development project marked the start of the company's rare-earth bonded magnet development. Prior to developing the rare-earth bonded magnet, Epson had been using platinum-cobalt magnets for the watches' rotor magnets. The problem with platinum-cobalt magnets was cost: platinum, a very expensive precious metal, was one of the main components. The high cost of these magnets, coupled with the commercialization of quartz watches, magnified the need to develop a high-performance, low-cost magnet. This prompted Epson to begin developing a rare-earth bonded magnet based on a SAM magnet that had already been developed as a spring balance magnet. In 1970, with some new manufacturing technology, Epson brought the SAM-D into the world.

Impact

Outstanding magnetism and workability in a small size. This combination of features led to the use and sales, from 1976, of SAM-D magnets for products other than quartz watches, including items such as small acoustic instruments and office equipment. In addition, several years later, as development competition in quartz watches spurred further scaling-down and thinning of these timepieces, watchmakers began looking for magnets that would also provide higher performance. Thus was launched a program to develop a new type of rare-earth bonded magnet. This program culminated in the announcement, in 1979, of the development of the SAM-DH, a Sm_2Co_{17} magnet that offered even better performance than the SAM-D. This product, which was commercialized in 1981, formed the platform for further expansion of Epson's magnet business.

*Then known as Suwa Seikosha Co., Ltd.