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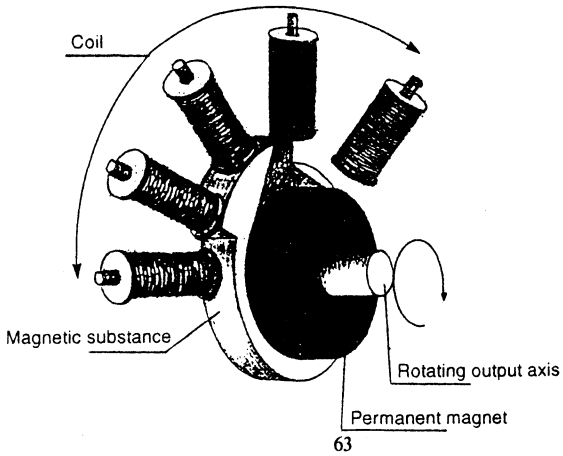
News Briefs

CONVERSION OF MAGNETIC ENERGY TO POWER

Nihon Rikken Co. (Japan) has developed a power generator that is capable of converting the magnetic energy of a permanent magnet to power, which is based on the principle of the convergence of a flux by a magnetic substance. The power generator consists of the following: (1) an electromagnet that is fixed on the supporting material and excited by electric current to generate a rotating field, (2) a rotating output axis positioned in the rotating field that freely rotates, (3) a permanent magnet placed around the rotating output axis and (4) a magnetic substance placed outside the permanent magnet that rotates along with the rotating output.

The magnetic substance rotates along with the rotating field when the electromagnet is excited as indicated by the flux of the permanent magnet. This causes the magnetic energy of the permanent magnet placed around the rotating output axis to be converted to power as the input energy and the rotating output axis receive this rotating torque.

When no current is applied to the electromagnet, the flux of the permanent magnet that passes through the magnetic substance spreads all over it, but when the current is applied to the electromagnet to generate the rotating field, the initial rotating torque occurs. This causes a rotor (magnetic substance and permanent magnet) to be instantaneously put in synchronisation and to move to the rotating torque motion that is generated by the twist angle between the rotating field and the magnetic axis of the rotor. As a result, the flux of the permanent magnet converges at the rotating field and rotates along with it when the electromagnet is excited. A new motor based on the principle of flux convergence indicates good efficiency for both ac and dc current. In particular, three–phase ac motor reached the efficiency of 97 to 98%.



MAGNETIC SENSORS TO DIRECT BLIND

A town in Sweden has installed a system based on magnetic sensors to help blind and partially–sighted people find their way around. The Hanmyo system, which was developed by NEC, the Japanese group, consists of ferrite particles embedded in paving slabs on a designated route through town. These interact with a magnetic sensor incorporated within the user's white cane, causing the cane to vibrate when it comes in contact with the ferrite pavement. At certain points in the town, the cane activates loudspeakers which provide information on street names and potential hazards. This is the first Hanmyo system to be installed in Europe, although 100 similar systems have already been installed in buildings and streets in Japan.

NEW MATERIAL FOR LIQUID HYDROGEN FUEL

Researchers at the Ames Laboratory, Iowa, U.S.A. recently announced the discovery of an important new material for magnetic refrigeration, a technology that may one day make it possible to replace fossil fuels with more renewable liquid hydrogen fuels. The material will reduce the overall cost of magnetic refrigerators by 40 percent and increase their efficiency. The material is a combination of Al, Dy and Er and replaces rare and expensive Pd by Al.

In a magnetic refrigerator, the new material will undergo rapid magnetisation and demagnetisation to manipulate heat. The new material reportedly responds to this process 30% better than the material currently in use, a compound composed of the elements of Gd and Pd. With the new material, a smaller superconducting magnet (the biggest capital cost in the refrigerator) is required to deliver the same cooling power. As technical advances make the magnetic refrigeration process cheaper and more efficient, scientist believe it may become possible to liquefy hydrogen so easily that liquid hydrogen will compete with or even replace fossil fuel as a source of power.

PERMANENT MAGNETS IN JAPAN 1993–94

In Japan, domestic production of barium ferrite magnets has almost ceased while strontium magnets are facing increasing competition from Nd–Fe–B bonded magnets. Nd–Fe–B magnets currently account for just over 70% of the Japanese market for rare earth magnets, because they are more powerful and are less expensive that Sm–Co magnets. Nd–Fe–B magnets cost Yen 30–40/g, compared with Yen 40/g for Sm–Co. Although Nd–Fe–B magnets have lower corrosion and heat resistance than Sm–co magnets, they are expanding their market share in voice coil motors, miniature speakers and magnetic imaging equipment in the medical sector.

Demand for bonded magnets, especially rare earth–based products, is increasing in office automation machinery, as electronic machinery becomes lighter and smaller. Resin–bonded magnets have a lower magnetic strength than sintered magnets. They have, however, numerous advantages: a high degree of precision in shaped products is easily obtainable, excellent mechanical strength, uniform magnetisation. Barium bonded ferrite magnets are mainly isotropic, whereas strontium–based products are mainly anisotropic. Isotropic Nd–Fe–B bonded

magnets, with price of around Yen 10/g, are increasingly competing with ferrite sintered magnets (under Yen 10/g), in terms of price, magnetism and malleability.

A NEW MAGNETIC SUBSTANCE CONTAINING CARBON

The National Institute of Materials and Chemical Research (Japan) has developed a new type of magnetic substance with iron particles covered by carbon. The saturation magnetisation is lower than that of a substance consisting solely of iron, but comparable to that of nickel. The density is less than one–half that of a substance consisting entirely of iron. A light magnetic substance highly resistant to water and acids is needed for use as a next–generation magnetic substance containing entirely carbon. It has been observed that the new magnetic material can incorporate properties lying midway between that of carbon magnets and conventional types of metal magnets which will pave the way for use in the manufacture of magnetic fluids.

PROGRESS IN CONSTRUCTION OF MAGLEV TRAIN IN JAPAN

An experimental line for the magnetic levitation train to be constructed in Yamanashi Prefecture in Japan has established sound footing for its construction work. Eighty six per cent of the land area necessary for construction has already been acquired and it is expected that the first phase of construction of the experimental line will be completed by the spring of 1996. Experiments will be conducted for three years from 1996 to 1999. The results will be important for determination whether maglev or conventional high–speed train should be adopted for the second trunk line between Tokyo and Osaka.

KAOLIN EXPANSION IN GEORGIA (USA)

Thiele Kaolin Co. is expanding kaolin production capacity at its Sandersville and Wrens facilities in Georgia by 20 to 30% over the next three years, to the total capacity of 1.5 million tonnes per year. The programme will involve the installation of a new spray dryer, a superconducting magnetic separator and additional processing control equipment. The expansion will mainly concern products for the paper industry.