Measuring system of magnetostriction under AC excitation using optical methods

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class variable inductor using orthogonal-core. Fig. 1 shows a schematic diagram of the core. Two c-cores are orthogonal in space. The core material is grain oriented silicon steel with the thickness of 0.23mm. The rating of the secondary output is 6.6kV-5A(33kVA). The third winding is for power supply to control circuit. The total weight of the core and windings is 154kg. As one trial, we made a partial gap in the contact surface interfacing primary and secondary cores in order to improve harmonic distortion of the secondary current. Fig. 2 shows the circuit of 3-phase variable inductor using the orthogonal-cores. The secondary lagging reactive power varies with the primary dc current I_c controlled by the dc-dc converter. Test results demonstrated that 100kVar is controlled by the current I_c of 23A. The secondary line currents were almost sinusoidal. The whole loss including the control power was 5.3kW when 100kVar is controlled. The variable inductor developed here can be put to practical use for VAR compensation in the medium-voltage distribution system.

[1]O. Ichinokura *et al.*, IEEE Trans. Magn., Vol. 29, 3225 (1993).

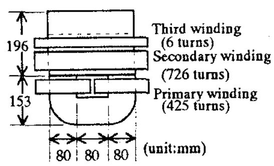

FIG. 1.

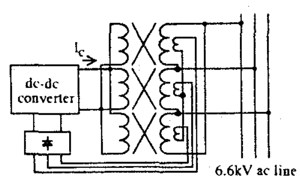

FIG. 2.

EP-12. A NEW MEANDER TYPE CONTACTLESS POWER TRANSMISSION SYSTEM–ACTIVE EXCITATION WITH CHARACTERISTICS OF COIL SHAPE. Fumihiro Sato*, Hidetoshi Matsuki**, Sinki Kikuchi*, Hiroshi Osada***, and Kyoshiro Seki*** (*Dept. of Elect. Engng., Tohoku Gakauin Univ., Tagajo 985 Japan, **Graduate School of Engng. Tohoku Univ., Sendai 980-77 Japan, ***Dept. of Engng., Iwate Univ., Morioka 020, Japan)

We propose a contactless power transmission system[1] using meander type coils. Figure 1 shows meander type transmitter coil. Receiver coil has the same shape of transmitter coil. Effectiveness for stabilizing the amount of the transmitted energy against the load displacement and electromagnetic noise emission are the features of meander type. When the pitch of the transmitter coil corresponds to the receiver pitch we could get maximum transmitting power. But in case of a half-pitch displacement between transmitter and receiver, the transmitting power becomes zero. This is the phenomenon that is characteristics meander type. The measured results of voltage induced on the receiver are shown in Fig. 2. In order to solve the problem, we realized Active Exciting System by the easy circuit composition whose system is surely agree with transmitter and receiver pitch. First, we could know the receiver movement distance for X direction by counting zero point in Fig. 2. Next, the movement along Y direction can be distinguished by the character which is shown Fig. 3. Therefore, the receiver position is grasped and transmitter-pitch is set up optionally.

[1]J. Murakami, H. Matsuki, and S. Kikuchi, J. Magn. Soc. Jpn., 17-2, 485 (1993).

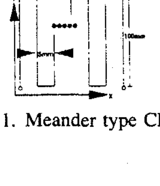
FIG. 1. Meander type CLPS.

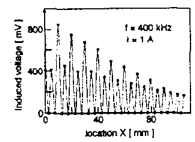

FIG. 2. Distribution of the induced voltage for X direction.

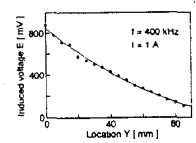

FIG. 3. Distribution of the incuded voltage for Y direction.

EP-13. MAGNETICALLY COUPLED HIGH FREQUENCY POWER DISTRIBUTION ARCHITECTURE. Praveen Jain (Dept. of Elec. & Comput. Eng., Concordia Univ., Montreal, PQ, Canada H3G 1M8)

In order to achieve fuse-less protection and connector-less power transfer a novel method of magnetic coupling in a high frequency ac power architecture[1] is presented in this paper. Figure 1 shows the system diagram of the proposed hybrid architecture which consists of a high frequency inverter, power distribution backplane and AC/DC converters. Each AC/DC converter consists of a transformer, a series resonant circuit, a diode bridge and an output filter. The series resonant circuit consists of a series inductor L_S and a series capacitor C_S. The series inductor is placed at the primary side of the transformer while the series capacitor is placed at the secondary side of the transformer. Further, the transformer is physically split into two halves-the primary side and the secondary side. The secondary side half transformer is physically part of the AC/DC converter. The series inductor is integrated with the primary side half transformer which is an integral part of the high frequency power distribution system. To verify the proof-of-concept of the proposed high frequency distribution system, a bread-board was built which demonstrated the following characteristics of the proposed system: (i) limited power flow (*less fire hazard*), (ii) low no-load current (*higher reduced-load efficiency and power factor*), and (iii) limited short circuit current (*fuse-less protection*).

[1]P. Jain, G. Edwards, C. Hubbard, and D. Bannard, 'High Frequency Power Distribution System,' U.S. Patent No. 5,444,608, August 22, 1995.

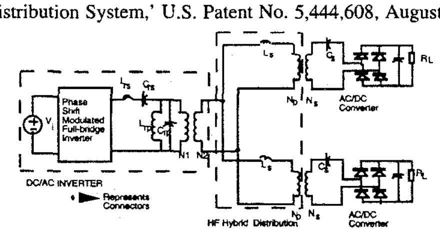

FIG. 1. Magnetically Coupled High Frequency Power Architecture.

EP-14. MEASURING SYSTEM OF MAGNETOSTRICTION UNDER AC EXCITATION USING OPTICAL METHODS. T. Nakase, M. Nakano, F. Fujiwara, and N. Takahashi (Okayama Univ., 3-1-1 Tsushima, Okayama 700, Japan)

It is fairly significant to measure magnetostriction of silicon steel to develop a method for reducing acoustic noise of electrical machines, especially transformers. In this paper, the accuracy of measuring system of magnetostriction under ac excitation using optical instruments, such as a laser Doppler vibrometer and a heterodyne displacement meter, is investigated. In order to avoid human errors, an automatic measuring system is