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POSSIBILITIES OF LIMITING RF INTERFERENCE IN THE LOW-FREQUENCY RANGE BY INTELLIGENT MEANS TO EMC ENSURE

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Modern mechatronic, electrotechnical and electromechanical systems used in light industry for the purpose of miniaturization and energy efficiency increase contain electronic components of control and automatic control subsystems, which by definition are referred to as dynamical systems that implement pulsed or discrete control. In this case, the switching of energy flows of control objects occurs with frequencies related to the low-frequency range, and the switched power varies from a parts of a watt to tens of kilowatts [1,2].

Such processes are accompanied by the appearance of industrial radio interference, the spectrum of which can contain frequencies that do not coincide with the canonical harmonics of the industrial frequency of mains (50/60 Hz), normalized by the requirements for electromagnetic compatibility and sub-frequency components that impair the quality of electricity for other consumers [3].

The technical realization of the means of providing the EMC based on an intelligent RFI filter is proposed, which realizes the process of adaptation of the parameters in such a way that the maxima of the suppression can be shifted to the region of dominant interference [4].

Since the basis of such filters are passive LC-links, when the frequency of interference is reduced, the required level of insertion loss is possible by increasing the corresponding inductance or capacitance of the main components. Such an extensive method of providing EMC by conductive paths not only leads to an increase in the dimensions and cost of the filter, but also has direct physical limitations due to the influence of parasitic parameters (see Fig. 1)

The introduction into the structure of such a filter of an additional link implementing the procedure of antiphase corrective action at the frequency of the dominant interference makes it possible to realize a mechatronic, electrotechnical or electromechanical system partially invariant to low-frequency interference.

Established methods of noise suppression by conductive chains require application of constructive, scheme-technical and organizational measures [1,2]. The most widely spread technical means, allowing decreasing the degree of conductive RF interference (RFI), are in their majority passive noise-suppression filters, the nomenclature of which covers more than a thousand part types, produced by almost a hundred companies [3].

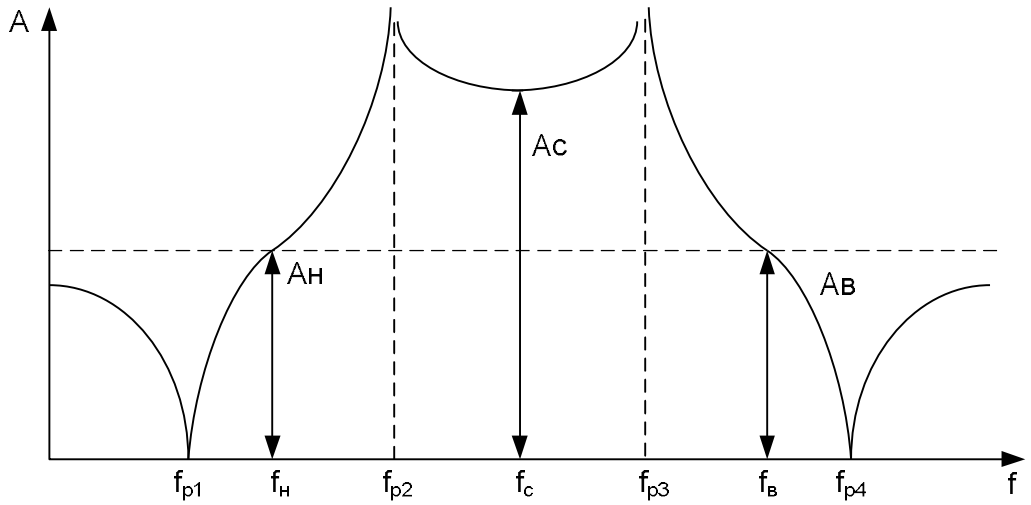

Figure 1 - The insertion losses of the LC-link taking into account the parasitic parameters L_C and C_L

Parasitic parameters of RFI filters components impose constraints on the insertion losses next to the own resonance frequencies. Smart network RFI filters are known, the control of which is performed through the appliance of microprocessors (MP), in which rearrangement of elements' basic/parasitic parameters takes places, which enables the relocation of the own resonance frequencies in the protected range of frequencies [4]. There is a number of devices, to which audiosystem can be surely referred, and which process harmonic signals of sufficient capacity, with frequencies, which detect into the standard protected frequency range. Besides, the number of electronic devices, connected to power supply and generating interferences, is constantly increasing, and stray parameters produce noticeable effect on RFI filter efficiency, hence controlling parameters which establish resonance frequency. Filter structure, which allows to adjust its characteristics in accordance with disturbance environment, is known [5].

A few procedures are possible to increase filter efficiency. Some of them require substantial computing sources, and such device implementation will lead to cost increase of the product [6].

The concept is suggested of noise suppression smart filter with remote data procession as an information system element. It stands to reason to supplement the known structure with the wireless module (transmitter) for remote operation control of RFI filter. Filter structure, which allows to adjust its characteristics in accordance with disturbance environment, is known [5]. A few procedures are possible to increase filter efficiency. Some of them require substantial computing sources, and such device implementation will lead to cost increase of the product [6].

For modern information systems the possibility of flexible dimensional scaling. Remote control and monitoring will be provided by the structure of RFI filter on Fig. 2.

Quick adjustment of filter parameters to the conditions of electromagnetic environment will lead to substantial decreasing of interference level on critical frequencies, hence providing electromagnetic compatibility.

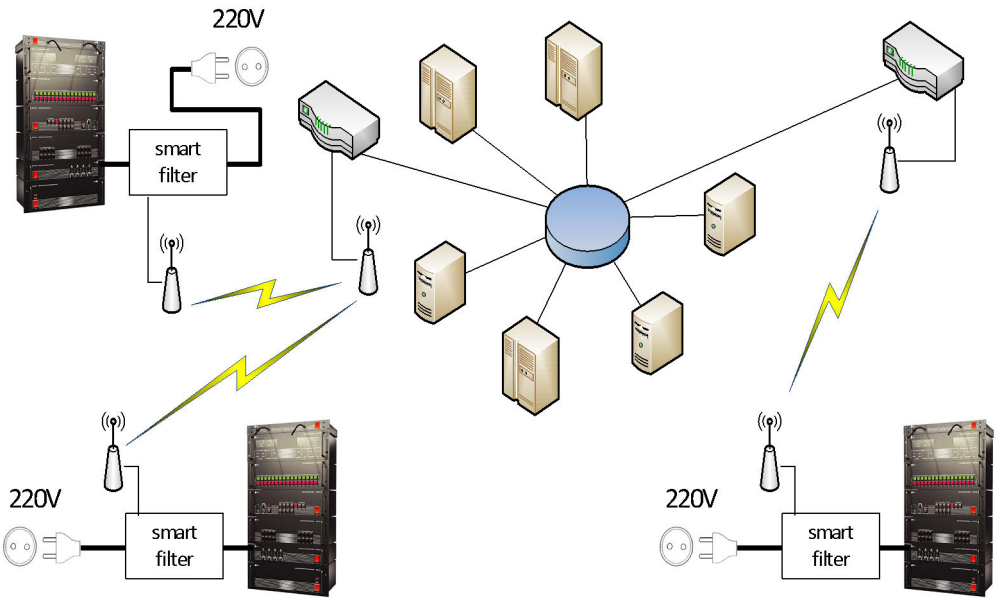

Figure 2 - Structural scheme of the complex system of smart RFI filter with remote distributed processing

A concept is brought out for a new smart RFI filter with wireless interface and distributed procession of real time data, which can be carried out on the basis of the modern component base.

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