subsystem, and we shall consider it, as the second level system, the constituent elements of which are the following: the Chancellor – the University Administration – the Departments – the Institute (e.g. the Dean's Office) – the Chair – the Teacher or the Lecturer – the Student. «The teacher or the lecturer – the student» link is the main participant in the Institute of the Higher Education, the College and the University. So, the education quality, on the whole, is being depended just on him. Further, the knowledge transfer is being carried out by «the teacher or the lecturer – the academic curriculum – the student» system.

So, in its turn, «the teacher or the lecturer» subsystem is being consisted in the following elements: the instructional work, the methodological work, the scientific efforts and the study, the family, the health, and also the leisure – time. Analogically, it is also quite possible to be presented the «student» subsystem.

The «academic curriculum» subsystem is being included in itself: the lectures, the practical trainings, the laboratory session, the textbooks (e.g. the printed and the electronic ones), the normative and the standard materials, the operating instructions and the user's guides, the testing, the final test, and the examination.

At present, the quite different information and the various control technologies and the testing facilities are being entered in the training and the educational process. But it should be noted, «the teacher or the lecturer – the student» reciprocal relationship necessity, and it is hardly be possible the thinking engineer or the scientific worker to be prepared by «the professor – the student» non – personal contact.

Further, it is quite be possible to be continued the necessary detailing and the specification, with due regard for the studies schedule, the studies type, the teacher's qualification level, and also the methods study influence.

So, the quality global function, having accepted the maximum value, has been taken for the system optimization:

$$F(x) = \sum \alpha_i f_i\,(x_i),$$

$x_i \leq$ xmax – the restrictions, where $f_i(xi)$ – the local (e.g. the system's separate elements) optimization functions; α_i – the weight coefficients; x, x_i – the variable parameters vectors; i = 1, 2, 3.. – the system blocks. The system programming is being used for the final results receiving.

Thus, it is quite advisably to be made up some mathematical models variants: just from the enlarged flowcharts up to the detailed charts, having singled out, as the main, well as the secondary cogs. The xi vectors are quite able to be presented by the functions, in particular the subsystem separate elements quality numerical scoring system.

Thus, the given analysis has already been shown, that more detailed quite different and the various factors recording is weighted with some other primary factors. On the other hand, the parameters, having entered just in the optimization formulae, are, to a large extent, the subjective ones, and it should be carried out the statistical analysis for the αi weight coefficients definition. On the whole, the task is the stochastic one. Moreover, it should be taken into the consideration, that the Institute of the Higher Education, the College, and the University public image has the great influence upon the final result. Nevertheless, the up – to – date mathematical apparatus and the computer engineering are being permitted to be optimized the whole educational process and the teaching training just in the specific Institute of the Higher Education, the College, and the University. Thus, the mathematical model research and the study are being carried out by the simulation method, having permitted to be considered the quite different options and the various variants, and also the separate structures and the system elements influence.

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LOSS MINIMIZATION IN THYRISTOR CONVERTER WITH DOSING CAPACITORS

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Thyristor converters of direct current with dosing capacitors in power train are widely used in different electro-technologic devices of medium and high (more than 100kW) capacity in which realization of a converter at transistors is difficult.

However, regulation of load current of such a converter is possible only with the help of pulse-frequency method in quite limited range, and in light load it is unworkable at all. Thyristor- condenser converter with an additional commutator of dozing capacitors allows regulating load current with Pulse Width Modulation (PWM) in wide range [1]. The regulation is carried with the help of commutator by partial recharge of a dozing capacitor around a closed L-C loop, passing load. It leads to additional losses in mentioned L-C loop, where except for additional thyristors and inductor, also two thyristors of a thyristor bridge are included.

In [2] a new scheme of a thyristor- condenser converter is suggested, it allows excluding losses in recharge loop. It is depicted in pic. 1.

The device is working the following way.

Let in point of time $t = 0$ voltage at dozing capacitor 5 has plus at lower plate and at additional capacitor 12- at upper plate. At that moment ($t = 0$) from pulse distributor 15 gating pulses to thyristors 1, 2 are given as there's zero at inverting input of element "I". Thyristors 1, 2 are gared and through dozing capacitor 5, load 7 and current probe 8 of load 7 current starts coming. If a signal of current Uз is close to zero then by appearing of even low load current a signal from current probe 8 load 7 will be equal to signal $U_з$ and impulse from im-

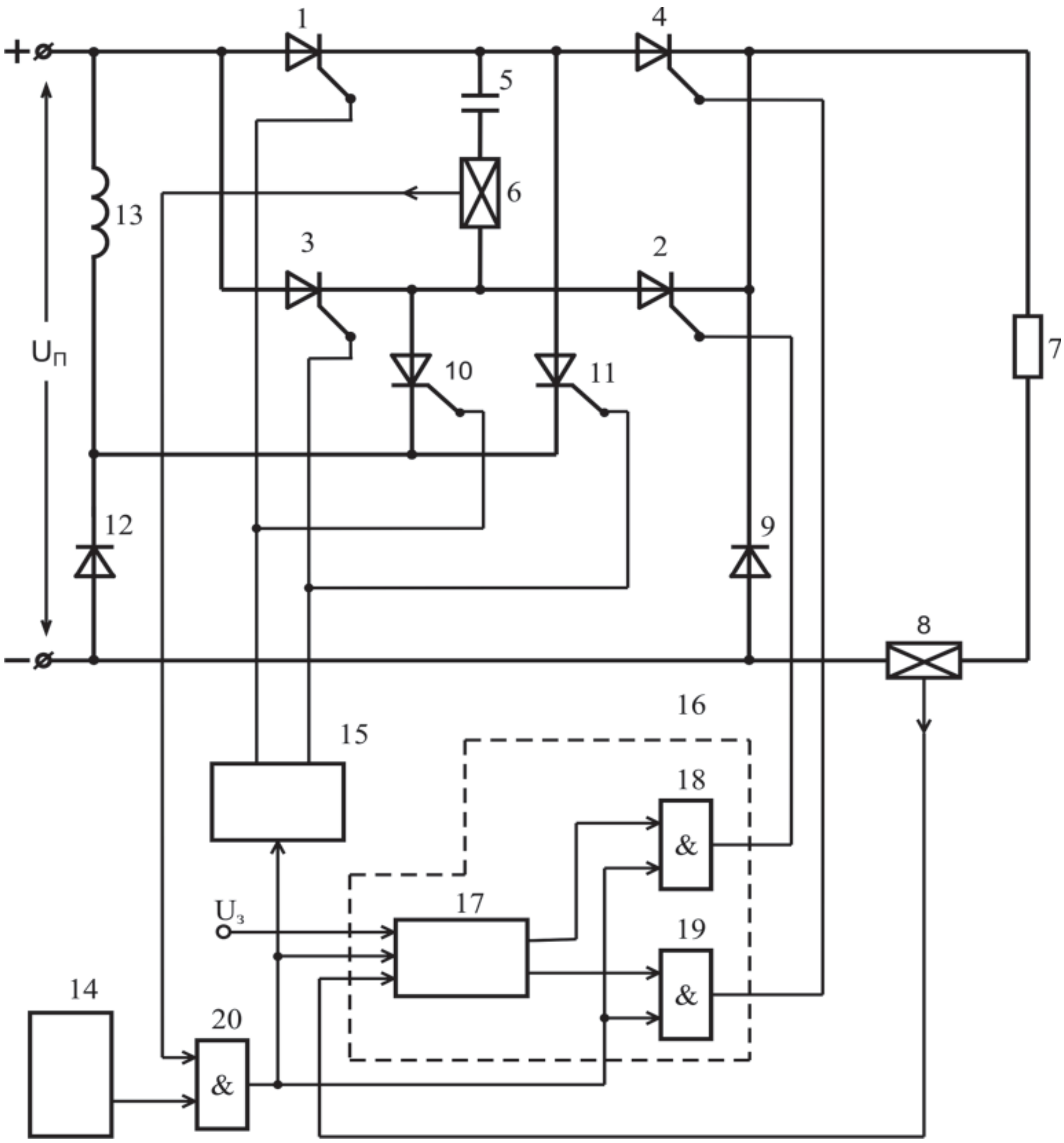

Рис. 1

pulse generator 14 will come through pulse-width modulator 17 almost without time shift. As a signal from the additional current probe 13 is equal to zero and it comes to an inverting input of a two-input logic element "I" 18, there'll be logical one at output of logic element "I" 18, that is impulse at control imput of additional thyristor 10. Thus, by low signals of $U_з$ impulses to control imputs of thyristors 1, 2 and an additional thyristor 10 will come almost simultaneously. Capacitance of the additional capacitor 12 is much less than capacitance of a dozing capacitor 5, that's why by low load current 7 voltage of dozing capacitor 5 is close to zero in the process of recharge, and voltage at additional capacitor 12 is changing. That's why switch on of additional thyristor 10 leads to switch off of thyristor 1, and load current comes through circuit of a positive side of a power supply $U_п$ – additional thyristor 10 – current probe 13 – additional capacitor 12 – thyristor 2 – load 7 – current probe 8 – negative side of a power supply $U_п$. Current goes till full recharge of an additional capacitor 12. At interval, necessary for recovery of thyristor gating characteristics, another impulse from impulse generator 14 comes. Through logic element "I" 20 and pulse distributor 15 another impulse at diagonal thyristors 3 and 4 comes, then to additional thyristor 11 and the process repeats. At the same time every commutation is possible only when ther's no current in diagonals of alternate current of thyristor bridge 1–4 and additional bridge 2, 3, 10, 11, as only in this case there's "resolving" zero at inverting inputs of logic elements "I" 18, 19, 20.

Ia a signal of Uз is increasing, an impulse shift from impulse generator 14 through pulse-width modulator 17 and logic elements "I" 18, 19 to control imputs of additional thyristors 10, 11 will increase, that means that there'll appear time shift between impulses from impulse generator 14 and impulses from pulse-width modulator 17.

Further increase of load current is characterized by the breakover delay of additional thyristors 10, 11, and voltage at dozing capacitor 5 in the process of recharge doesn't yet reach power supply Uп voltage. Current through capacitor 5 controls current probe 6. Bypass diode 9 by-passes load 7 and current probe 8.

When load current reaches critical point, when voltage at dozing capacitor 5 in the process of recharge becomes equal to voltage Uп and energy, given to load by one cycle of recharge becomes constant:

$$W = C\frac{(2U)}{2} = 2CU = \text{const},$$

further increase of load current is possible only by decreasing load impedance as in all known thyristor- condenser converters with dozing capacitor, included successively in load circuit. Such mode can be used in electro-technologic devices, for example, with variable resistance of a spark gap.

The device allowed not only regulating with pulse-width modulator method in a wide range of loads, but also excluding all additional losses, common to known converters of similar use.

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