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RESEARCH OF DETERIORATION AND PRODUCTIVITY OF A BAND SAW

Litvinov A., Kornienko V.
Kuban State Technological University
Krasnodar, Russia

In the given work specific characteristics of deterioration of band saws are considered that allow to predict sawing up process and raise firmness of the tool and its productivity.

Deterioration of teeth of a band saw on a back surface was measured in process of experimental sawing up material in diameter by 160 mm, which was steel 45. We applied the band saw machine model C8523 Joint-Stock Company "special design bureau ALMS" As a tool was used bimetallic band saws of firm "Rongen" in height of 27 mm with variable step of teeth at length of 25,4 mm As applied 10 % of a solution emulsion.

The band saw has many teeth which of them cut only small part in time of cutting. Sawing up by a band saw is one of the most effective ways of cutting considering distribution of heat and effort of cutting.

Deterioration of teeth of a band saw is typical to the mechanism of deterioration of other cutting tools. And still deterioration occurs in unusual way. Teeth wear out in the localized zones - on a back of a tooth and on its lateral surfaces where the tooth contacts to a processed material. At definition of firmness intensity of deterioration of a band saw is the most convenient for defining at measurement of deterioration of teeth on a back surface. Deterioration can be divided into three zones: a zone extra earnings, an operating conditions and a zone of critical deterioration during which time it is necessary to replace a saw.

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RATIONALIZATION OF SECONDARY POWER SUPPLY

Magazinnik L.T.
Ulyanovsk State Technical University
Ulyanovsk, Russia

Single phase secondary power supply (SPS), thanks to small weight/torque ratio (kg/kW) and quick response time, has found widespread use in a range of capability from tens W (home video) to several kW (electrical constant-voltage regulator, electric arc welding sets and so on).

One of the essential disadvantages of SPS is low power factor (PF). By using a power factor corrector of modified algorithm of operating it, which allows PF up to 0, 95 and more [1], this issue can be considered solved. The following rationalization of SPS in terms of, for example weight/torque ratio decrease and wastage decrease has the following restrictions:

- because of asymmetry of output strain of a chopper power isolation transformer is fulfilled with an airspace in the core and is used only at a private loop, that makes ineffective two- cycle bridge scheme of a chopper in comparison to single- cycle, and eventually leads to transformer overall factors increase.
- increase of output strain frequency of a chopper allows to decrease size of a transformer and smoothing inductor. However, wastage in power transistor is increased. The last is especially essential for powerful SPS.

Including capacitors successively in a chain of power transistor primary coil allows excluding constant constituent in output strain of a chopper and in some cases decreases commutation wastage in power transistors.

Using semi-bridge transistor choppers with capacitors in a power chain for SPS provides two-cycle mode of transformers while there's no constant constituent in a stress curve. This allows using a core without airspace and with high extent of rectangularity of a loop. As a result transformer's size and wastage in it may be decreased (with the same frequency) in 2-4 times in comparison to schemes without capacitors. The advantage of this solution is also simplicity of a chopper power part (two-cycle mode is achieved only by two power transistors). Correspondingly, operating system is simplified.

A bridge scheme, as well as semi-bridge, allows two-cycle mode of a power transformer and its whole usage. There are twice more power transistors and output channels of chopper operating system in this scheme, but there's only one commutating capacitor.

The two considered SPS schemes with capacitors in power chain are identical by its external characteristics, however bridge scheme (except for low power SPS) is more preferable than semi-bridge.

Including capacitors into chain of primary coil of chopper power transformer gives an opportunity to use the core of the transformer without airspace and with little excitation current and with the use of the whole loop that allows essentially decreasing its size. Natural external characteristic of capacitor choppers has lineal part with rigidity determined by total resistance of SPS and a section with load constant power. The lineal part may be, for example, used for welding in carbon dioxide, and section with constant power is ideal for welding in the air. Moreover, capacitor's real doubling of rectified voltage amplitude simplifies

starting and arc stabilization. At a section with constant power current through chopper transistors is broken, that means transistor commutation is without current, wastage is minimal, and that allows increasing frequency and decreasing SPS sizes. Technologically necessary quantity of steps of power may be achieved by two-three capacitors of different volume with a step switch without any close ADS. Not operating chopper- a chopper without PWM or any other way of strain regulation allows solving a problem of galvanic separation of chopper power transistors with the help of a tiny isolation transformer at self-excited oscillator output. There's no need in expensive power units with composite transistors and optoelectronic isolation [2]. Defense from through currents in "non-operating" choppers may be achieved by small-size triple wound choke [3] and current limitation by the diode-thyristor block action upon the operating system.

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NEW SYSTEM OF SEMI-BRIDGE TRANSISTOR CHOPPER OPERATING

Magazinnik L.T.
Ulyanovsk State Technical University
Ulyanovsk, Russia

Transistor choppers, both single and two cycle, have found a use in different secondary power supply sources [1]. Transistor chopper operating systems are devised on typical microcontroller level [2]. This system is used to operate any two cycle chopper and may differ only by the quantity of output channels (for one bridge- four channels, for semi-bridge- two channels). The operating system generates impulse signals at operating inputs of chopper's transistors, on-off time of which determines the duration of transistor's on-mode. In semi-bridge chopper the necessary transistors' on-mode duration decreases by the stress growth. That means the necessary transistors' on-mode duration may be much less than the duration of gating impulses from the operating system's output. That leads to outrageous wastage in transistors.

The suggested operating system of semi-bridge transistor chopper [3] is shown at fig.1 and consists of semi-bridge transistor chopper 1, operating system 2, and automatic regulator 3. The chopper includes two capacitors 4 and 5, successively connected, two transistors 6 and 7, also successively connected, and two bypass diodes 8 and 9, shunting in backward direction transistors 6 and 7. Vertex of capacitors 4 and 5 and transistors 6 and 7 make an alternate current diagonal, which includes load 10.

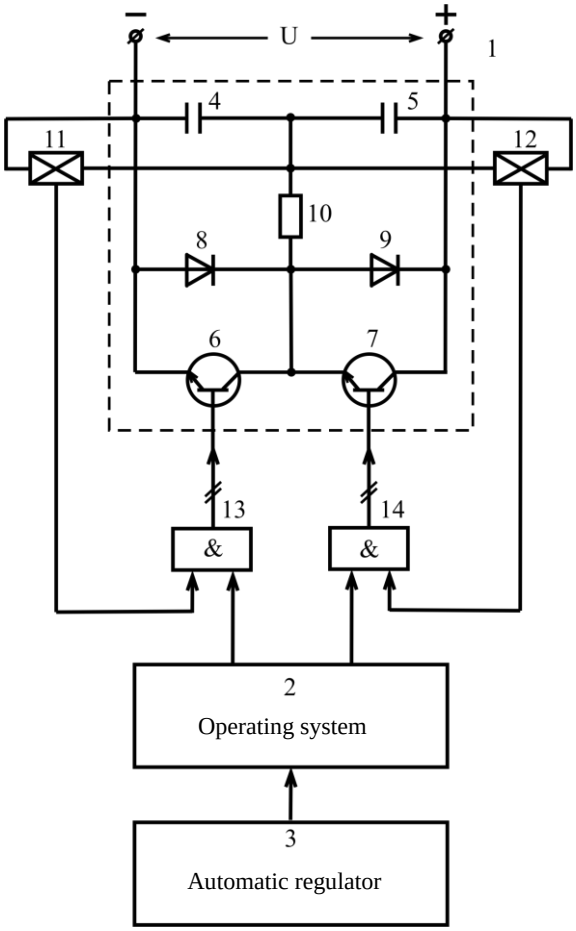

Figure 1

Capacitors' 4 and 5 and transistor's 6, 7 exposed ends are combined and respectively connected to direct-current voltage source.

Thus, block 1 represents semi-bridge transistor chopper identical to known prototypes.

Block 2 contains typical operating system of semi-bridge transistor chopper, built on the principle of pulse-width modulation which has two outputs (by the chopper's transistors). Detailed scheme of block 2 is presented in [1]. Automatic regulator 3 is connected to input of block 2, which is also a typical unit, usually presented as analog comparator. Additional elements of scheme pic.1 are two voltage sensors 11 and 12 and two logical two-input elements "I"13 and 14. Voltage sensors 11 is turned on by input in parallel with capacitor 4, and voltage sensors 12 is turned on by input in parallel with capacitor 11.

Sensor's 11 output is connected to one of the inputs of logical two-input element "I"13, and voltage sensor's 12 output is connected to one of the inputs of logical two-input element 14. Exposed inputs of logical two-input element "I" 13 and 14 are connected with respective outputs of operating system 2, and outputs of logical two-input element "I" 13 and 14 are connected with respective inputs of transistors 6 and 7. To simplify, buffer circuit of galvanic separation