

Two SPS networks with condensers in the invert power circuit are considered below: a half-bridge and full-bridge ones.

The half-bridge network provides a push-pull transformer work mode with a total absence of continuous component in the voltage curve. It allows using the heart without air isolation and with high degree of hysteresis loop rectangularity. Hence, the transformer frames and its losses can be reduced (at the same frequency) two-fourfold compared to the networks [2] without condensers.

The indisputable advantage of this network is the invert power circuit simplicity (push-pull mode is provided by only two power transistors). Respectively, the controlling system is also simplified.

The bridge network provides a push-pull transformer work mode and, respectively, its full use. The quantity of power transistors and outlets of the invert circuit controlling system in this network is twice as many, however, there is only one commutating capacitor and its band capacitance is eight times as much against the total capacitance of the capacitors in the half-bridge network.

Reduction of the compared versions to one and the same load gives absolutely identical both gain and rectified voltage regulation characteristics of the invert circuits. Voltages across power transistors in both versions are also identical and equal to the voltage of the invert circuit input; however, the current amount through the bridge invert circuit is twice as little. Hence, the total "installed capacity" of the power transistors in both networks is equal.

Conclusions:

1. Including capacitors into the power transformer primary invert circuit gives an opportunity to apply the heart of this transformer without air isolation, with little field current and using on a complete hysteresis loop, that allows reducing its mass-volume showings essentially.
2. In permanent output the current through invert circuit transistors has an intermittent nature, i.e. the transistors' commutation is currentless, losses are minimal, that allows increasing the line-locked frequency and, respectively, decreasing mass-volume showings of the SPS.
3. The two considered SPS networks with capacitors in the power circuit are identical

on their voltage regulation characteristics, however, the bridge network (excepting the low power SPS) are preferable against the half-bridge one.

References:

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TRANSISTOR CHOPPERS FOR ELECTRIC-ARC WELDING

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A disadvantage of native and foreign secondary power sources (SPS) designed for electric welding is the fact that current amplitude in the invert circuit power transistors of the specified SPS designed for electric welding units is great and makes about one third of the load current output, i.e. in the electric arc. The specified disadvantage is explained by the fact that in order to stabilize the electric arc "combustion" and its easy "ignition" the denoted devices designers have to make the matching transformer secondary voltage greatly overstated compared to the arc voltage and equal to about 100V.

At the same time it is known that in practice the arc voltage does not exceed 25V when welding in the air, and when welding in CO₂ and argon the arc voltage is considerably lower. The described disadvantage, i.e. voltage uprating, leads, first - to cost and power excursion of the invert circuit transistor; second - to their losses increase.

For this essential fault elimination a new SPS network [3] is offered, in which the matching

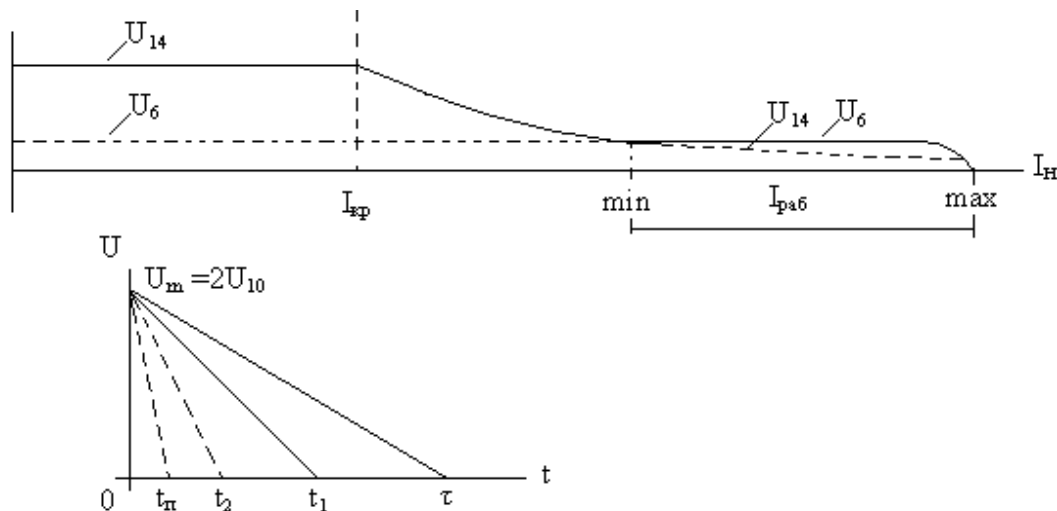
transformer is provided with a supplementary secondary winding with an in-series capacitor, that has allowed imposing the “ignition” function and that of electric arc stabilization in the field of low currents on a supplementary power source and reducing the voltage of the matching transformer main secondary winding up to 35V and, in such a way, reducing the invert circuit transistor current amplitude almost thrice.

The device performed according the offered network is characterized by the following voltage regulation characteristics:

1. The main power source voltage regulation characteristic (U_1 chart 1) – is typical of the system closed in current. The characteristic is depicted perfectly stiff. Really, it has a little inclination conditioned by the supply

$$U_m = \frac{1}{c} \int_0^{\tau} i \cdot dt \approx \frac{I_{kp} \cdot \tau}{c}, \quad (1)$$

as during the time τ the load current is reputed to be invariable ($\tau \approx 10^{-5}$ c).



By analogy, the voltage excursion in the mode $I > I_{kp}$

$$U_m = \frac{1}{c} \int_0^t i \cdot dt \approx \frac{I_t \cdot t}{c} \quad (2)$$

As the voltage excursion U_m in the compared modes is identical, the expressions (1) and (2) can be equated:

$$\frac{I_{kp} \cdot \tau}{c} = \frac{I_t \cdot t}{c} \Rightarrow \frac{I_{kp}}{I_t} = \frac{t}{\tau}. \quad (3)$$

main impedance and internal impedance of the device itself.

2. The supplementary power supply voltage regulation characteristic (U_2 chart 1) at load currents $I_H \leq I_{kp}$ linear and hard, as the capacitor doesn't manage to charge during the time of the τ half cycle to auxiliary secondary winding voltage excursion and that is why (if neglecting significant losses in the capacitor) doesn't influence the amount of half- period average voltage U_2 . At $I_d > I_{kp}$ (chart 1) the capacitor charges up to the voltage excursion during the time $t_1 < \tau$ (chart 2). The rectified voltage amplitude in the capacitor at $I_d = I_{kp}$

But in concordance with the chart 1 $t_1/\tau = U_{d(t_1)}/U_{d(\tau)}$, where U_d is the half-period average voltage. Thus, $I_{kp}/I_t = U_{d(t)}/U_{d(\tau)}$, from which $I_{kp} \cdot U_{d(\tau)} = I_t \cdot U_{d(t)} = cons$ at any $t < \tau$.

So, in the field $I_{kp} < I < I_{paб.min}$ the supplementary power supply has got a hyperbolic voltage regulation characteristic with load constant power: $P_d = U_d \cdot I_d = cons$, that is ideally suited for the electric arc in the air.

At $I > I_{paб.min}$ the supplementary supply is locked as its voltage is lower than that of the main source, and, finally, at $I = I_{max}$ the voltage of both sources verges towards the null tight under the influence of the current feedback within the system of the invert circuit control. From the quoted diagrams one can see that in the field of operating load currents (welding) the supplementary source, i.e. diode bridge, is locked. At the same time relatively high open circuit and small current voltage provides an easy "ignition" and the arc maintenance at small currents.

In the known secondary power sources the secondary winding voltage of the matching transformer, as it is shown above, ≈ 100 V.

In the offered device voltage is lowered up to 35 V, it means that at the load current equal to those of the specified devices, the voltage excursion in the invert circuit transistors will be $100/35 \approx 2,85$ times as little, that is rather vital as the power transistors or solid-state compound modules, first, make up an essential part of the total cost of the device; second, the reduction in current reduces losses. Notice, that the losses in the secondary power source are ignorable as it is switched on only for short time. Thus, the offered device doesn't trail the known one in the sense of generality, and, at the same time, possesses essential advantages in the mode of welding in the air: the 2 invert circuit current of the transistors is lowered almost three-fold compared to the current (voltage excursion) in the known devices, and the conditions of the electric arc "ignition" are even somehow improved as the electrode contact with a weldment is attended by

a forced energy discharge accumulated in the filter capacitor.

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EFFICIENCY OF MODELING NUMERICAL METHODS USE FOR ANALYSIS OF TEXTILE EQUIPMENT WORK INTENSITY

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In recent time in connection with stiff competition of textiles at fresh stock fabrics manufacturing in domestic market of Russia the problems of accelerated development of production cycles and performing express-monitoring of textile equipment work intensity for providing optimum performance of its work and obtaining high quality fabrics have become ones of the current interest.

The work intensity valuation of textile equipment is carried out with the help of special means of measurement using tensometry method. The advanced native weaving machinery work intensity measuring device is express-diagnostic tools of various modifications.

The thread tension is known to be the main parameter characterizing the tools' and machines' work intensity. In textile production activity threads are affected by stretching forces and frictional ones taking place between the thread and guiding devices of the machines and tools. If the parameters are preset rationally the deterioration of physical and mechanical properties of the thread doesn't occur. Only insignificant decrease of thread linear density on