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TECHNIQUE OF DEFINITION OF PARAMETERS OF THE WINDING OF COMMUNICATION OF THE WELDING TRANSFORMER

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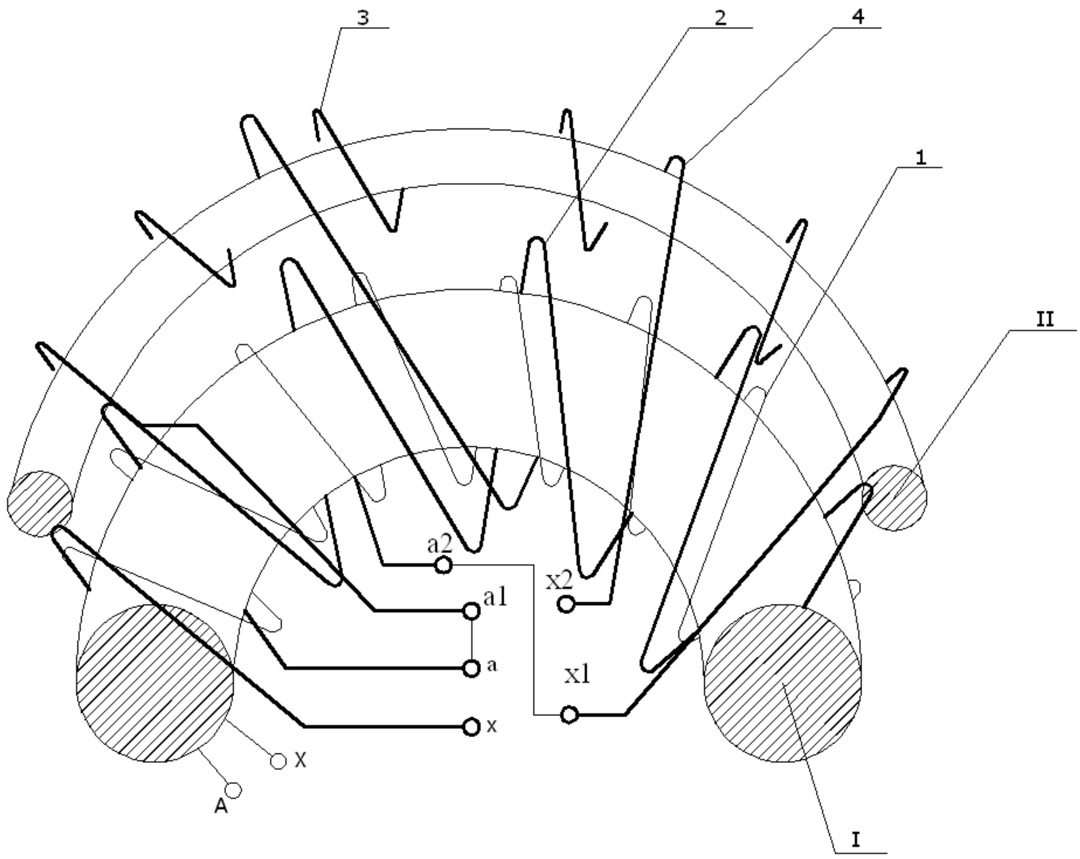
Welding transformers on ring magnetic circuits have advantages:

- There are no stray fields;
- There are no mechanical regulators of a current of welding;
- The weight and cabarets are reduced.

Research objective - to prove parameters of a winding of communication of the welding transformer on ring magnetic circuits.

Research technique. The new design allowed to control a current of welding by compensation of components of a magnetic stream.

In drawing 1 the transformer design is resulted.



Drawing 1. A design of the welding transformer

The transformer consists of an annular magnet I on which are reeled up primary 1 and secondary 2 windings. The winding is reeled up on a magnet II 3. Leading-outs of this winding are consistently connected to the secondary winding of the transformer and a winding of communication 4 which embraces both magnets. Resistance of a winding 3 and its constructional parameters pay off on the maximum current of welding.

Results of researches. Convolutions of a winding of communication control a welding current. The maximum quantity of convolutions of a winding of communication it is definable proceeding from the minimum current of welding (60 … 80).

An anode drop on a winding 3 at the maximum current of welding

$$\acute{U}_{min} = \acute{U}_2 - \acute{U}_\partial - \acute{I}_{2max} Z_2, \quad (1)$$

Where $\acute{U}_2$ - voltage of the secondary winding of the transformer, $\acute{U}_2$ = 60 In; $\acute{U}_\partial$ - voltage of a welding arch, $\acute{U}_\partial$ = 20 … 25 In; $\acute{I}_{2max}$- as much as possible accepted current of welding, $\acute{I}_{2max}$= 200 And; Z_2- resistance of the secondary winding, the Ohm.

Analogously at the minimum current of welding:

$$\acute{U}_{max} = \acute{U}_2' - \acute{U}_\partial - \acute{I}_{2min} Z_2, \quad (2)$$

Where $\acute{U}_2'$- voltage of the secondary winding and a communication winding, $\acute{U}_2'$ = $\acute{U}_2$ ± $\acute{U}_{зв}$

At the concordant joint of windings 2, 3, 4 voltage on an exit increases a pas magnitude.

Let's define resistance by which it is necessary to increase to gain the minimum current of welding.

$$\Delta X = X_\Sigma - X, \quad (3)$$

Where X_Σ - a total induced drag of windings 3 and 4, the Ohm; X - an induced drag of a winding 3, the Ohm.

$$\Delta X = L_\Sigma 2\pi f, \quad (4)$$

Where L_Σ - total inductance of the transformer and a winding 3, Gn.

$$L_\Sigma = \frac{\mu\mu_0 h_\Sigma W_{зв}^2}{2\pi} ln\frac{R_2}{R_1}, \quad (5)$$

Where h_Σ - total altitude of magnets of the transformer and a winding 3, m; μ - relative magnetic permeability; μ_0 = 4 π · 10-7 Gn/m - a magnetic constant; R1, R2 - internal and external radiuses of a magnet of the transformer, m; Wзв - quantity of convolutions of a winding of communication, piece.

Then an induced drag ΔX:

$$\Delta X = \frac{\acute{U}_{max}}{\acute{I}_{2min}} - \frac{\acute{U}_{min}}{\acute{I}_{2max}}. \quad (6)$$

Substituting values in (4) we gain

$$\frac{\acute{U}_{max}}{\acute{I}_{2min}} - \frac{\acute{U}_{min}}{\acute{I}_{2max}} = f h_{\Sigma} W_{зв}^2 \mu\mu_0 ln\frac{R_2}{R_1},$$

(7)

From here number of convolutions of a winding of communication

$$W_{зв} = \sqrt{\frac{\acute{U}_{max}}{\acute{I}_{2min}} - \frac{\acute{U}_{min}}{\acute{I}_{2max}} \quad f h_{\Sigma} \mu\mu_0 ln\frac{R_2}{R_1}} \tag{8}$$

At the concordant joint of a winding of communication and the secondary winding of the transformer voltage on an exit increases by magnitude that leads to increase in a current of welding.

$$E_{зв} \approx \acute{U}_{зв} = 4{,}44 f W_{зв} B \;\; S_{тр} + S_{др} \;\; . \tag{9}$$

Number of convolutions of a winding of communication it is definable:

$$\frac{\acute{U}_2 \pm \acute{U}_{зв} - \acute{U}_{д} - \acute{I}_{2min} Z_2}{\acute{I}_{2min}} - \frac{\acute{U}_2 \; - \acute{U}_{д} - \acute{I}_{2max} Z_2}{\acute{I}_{2max}} = f h_{\Sigma} W_{зв}^2 \mu\mu_0 ln\frac{R_2}{R_1}. \tag{10}$$

After mathematical manipulations we gain the equation. Solving it we define number of convolutions of a winding of communication at the concordant joint.

$$f h_{\Sigma} \mu\mu_0 ln\frac{R_2}{R_1} W_{зв}^2 - \frac{4{,}44 f B (S_{тр} + S_{др})}{\acute{I}_{2min}} W_{зв} - \frac{\acute{U}_2 - \acute{U}_{д} - \acute{I}_{2min} Z_2}{\acute{I}_{2min}} - \frac{\acute{U}_2 \; - \acute{U}_{д} - \acute{I}_{2max} Z_2}{\acute{I}_{2max}} = 0. \tag{11}$$

In a wide range it is expedient to apply the counter joint to regulating of a current of welding. At such joint from induced drag increase to decrease the terminal voltage of a winding of welding. Number of convolutions of a winding it is definable from the equation:

$$f h_{\Sigma} \mu\mu_0 ln\frac{R_2}{R_1} W_{зв}^2 + \frac{4{,}44 f B (S_{тр} + S_{др})}{\acute{I}_{2min}} W_{зв} - \frac{\acute{U}_2 - \acute{U}_{д} - \acute{I}_{2min} Z_2}{\acute{I}_{2min}} - \frac{\acute{U}_2 \; - \acute{U}_{д} - \acute{I}_{2max} Z_2}{\acute{I}_{2max}} = 0. \tag{12}$$

Dependence of a current of welding on quantity of convolutions

Concordant turning on		Counter turning on	
Number of convolutions, piece.	The Current, And	Number of convolutions, piece.	The Current, And
1	205	1	190
3	203	3	161
5	189	5	127
7	168	7	86