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Automated Device for Welding the Window of the Car Window Heating System

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Annotation: The article presents a design for soldering the terminal of the autoglass heating system in a semi-automatic mode, intended for manufacturers of automotive glass. The possibilities of the proposed design, the differences from existing designs, and the method of use are described. An algorithm for the operation of a semi-automatic structure is presented.

Keywords: Auto Glass, Terminal, Soldering, Pneumatic Cylinder, Controller, Algorithm, Design, Bellows, Guide

Electric heating systems have been set up to protect cars from freezing their rear and front windows on cold days. To do this, they are formed on the surface by evaporation and spraying in a conductive vacuum involving a silver mixture. The technology of forming a "conductive grid" on the glass surface is fully developed and widely used. However, work is still underway to improve the technology of installing a terminal (terminal) on the glass, which is designed to connect electricity to this heating conductor. Semi-automatic, manual modes of technology are used, but the result in them remains completely dependent on the human factor [1,2,3].

Figure 1. TAI-SWS semi-automatic terminal soldering device [3].

Our research is aimed at improving the result by reducing the human factor in the process of welding the window heating system terminal. This research is relevant to the automotive window manufacturing industry.

The main technological parameters to be considered during the welding of the terminal are:

- Proper installation of the window on the welding table in the specified coordinates;
- Maintain the temperature of the welding torch in the given range;
- Place the terminal correctly in the place of window welding;
- Control of pressure force on the terminal block;
- Establishment of a system of transmission of welding intermediate material for welding;
- Time control of the payline at the terminal.

During our research, it was found that it is expedient to study each of the listed technological processes separately, to automate some stages and to implement some manually. Not only the increase in

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productivity, the quality of the process, but also the cost of recognizing the proposed device has become one of the key issues in reaching this conclusion.

A schematic view of the proposed window heating system terminal welding device is as follows:

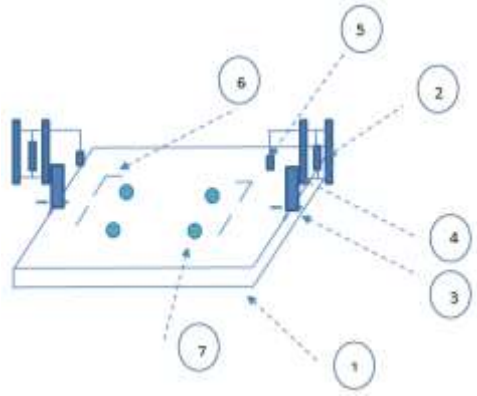

Figure 2. Schematic representation of the terminal welding device.

1- device table, 2- pneumoslinder, 3- mechanism for adjusting the welding unit to the glass plane, 4- mechanism for adjusting the welding unit to the height of the window, 5- device for adjusting the weld with a cellophane, 6- devices for orienting the window in the plane, 7- pneumatic holding the window standing

When studying the production process, it became clear that the glass was produced in production batches (a set of windows of a certain number), and the batch will have windows of a certain brand. It is not difficult to place the windows directly on the table if the boundary barriers are fixed to the exact size windows of the welding table. Therefore, in the system we offer, it is sufficient to set the boundary barriers once for each batch window, and it is not necessary to automate this stage.

The car window heating system should consume 200 W to 350 W depending on the size of the window, and its contact should be able to conduct current around 15 A. Therefore, welding the contacts (terminals) to the heating grid is important. A mini thermocouple output signal mounted on the soldering iron was connected to the analog input of the controller to measure the solder temperature during welding. The control line is connected to the discrete output of the controller via the relay block. The controller was designed to maintain a temperature of 170 -190 0 C as determined by the PID law [4]. In order to maintain clear standards in the manufacture of car windows, the terminals that are installed on the existing windows of almost all heating systems have the same size and shape:

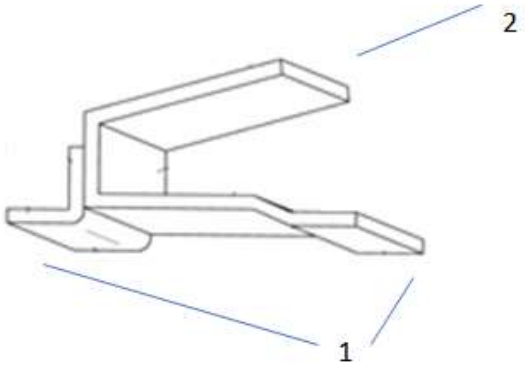

Figure 3. The form of the term. 1- window connection to the heating system, 2- connection to the external power supply.

Automotive manufacturers buy terminals from other companies. At the places of their welding (Fig. 2.) 1 is usually covered with welding material (pripoy). The amount of welding material per unit area is around 0.18 to 1.43 g / cm 2. To weld the terminals, it is ensured that they are held in the payline gap using a special holder. The holder consists of a core electromagnet, the holding and release of which is organized by means of relays involved in the system [5].

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Each batch is adjusted separately to the windows to direct the solder to the welding position of the terminal. To do this, a sliding system has been developed for the "x" and "u" axes of the part that holds the payanik. Welding of the beam is carried out on the basis of a pneumatic mechanism.

When welding the soldering iron, the pressure on the terminal is organized on the basis of a special "bellows" variable volume detail. After the payload is automatically lowered onto the terminal, pressure is applied to the bellows and a pressure force is created on the payline. The pressure is measured by the controller using a pressure sensor in the cylinder and controlled at a given value. The discrete output of the controller limits the pressure in the cylinder to a given value by means of an electric pneumatic relay. The pressure value is determined experimentally.

During welding, the holding time of the payline at the terminal is determined experimentally and this time is held by the controller. The starting point of the time is given to the controller by the pneumatic relay signal that the payline is lowered to the welding position by pneumatic start. Based on the algorithm program pre-installed in the controller, the time is calculated, and at the set time the controller launches the pneumatic cylinder via a pneumatic relay with a discrete output signal and raises the payload.

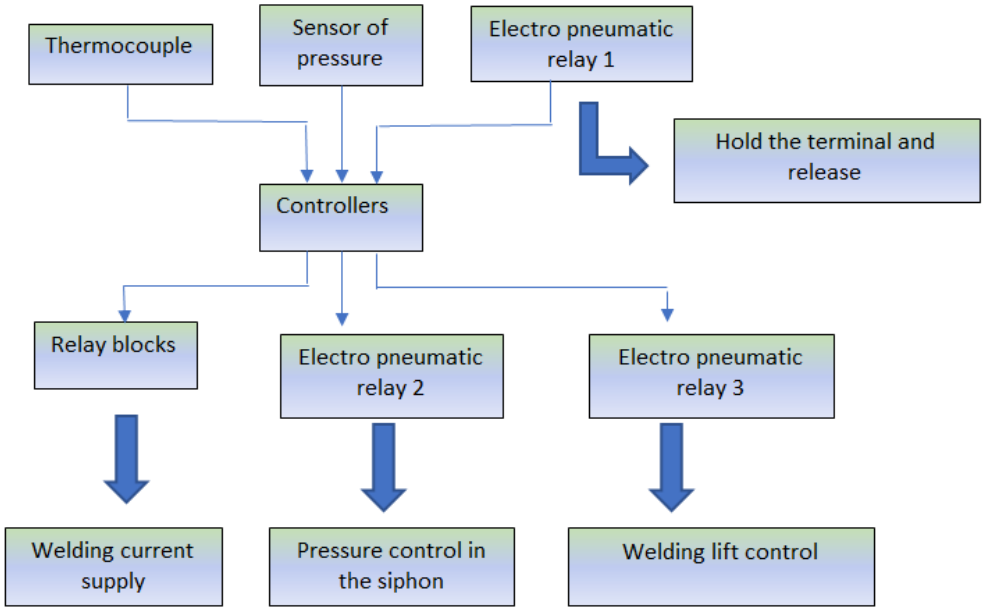

Figure 4. System management structure

A special cushioning principle has been established to ensure that no stiffness is observed for the glass when lowering the bead into the terminal welding position (Fig. 1. (5)). As soon as the payal reaches the welding point, the automatic stops moving and the generation of compressive force through the bellows begins. If the compressive strength is greater than normal, the adhesion of the window base heating system conductor to the glass may be affected. This reduces the reliability of the window heating system.

The main automation devices of the proposed project are: PLK 150 (Oven company), thermocoupleless body DTP L (HK), small pressure sensor PD150, pneumatic cylinder Camozzi 24N2A16A050, electric pneumoromolele 4V210-08, relay block, finik.

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