"HENRI COANDA"
AIR FORCE ACADEMY
ROMANIA

GERMANY

"GENERAL M.R. STEFANIK"
ARMED FORCES ACADEMY
SLOVAK REPUBLIC

INTERNATIONAL CONFERENCE of SCIENTIFIC PAPER
AFASES 2011
Brasov, 26-28 May 2011

SPECIALIZED DEVICES FOR POSITIONING AND FIXING, THE MECHANIZATION OF WELDING OPERATION

Florin SAPARIUC *, Adrian DRAGAN *, Ionut UNCU *, Alin PARPALEA *, Iacob-Nicolae TRIF *

*SIM Faculty, Transilvania University of Brasov, Brasov, Romania

Abstract: *The paper presents the main fixtures, mounting and positioning for mechanization of welding operations. I presented a series of devices: the lever, sliding piston, screw type linear paw clamping, and clamping screw and joint angle 90°.*

These devices were manufactured and tested in the Laboratory of Mechanization and Automation of Welding Processes in the Faculty of Materials Science and Engineering, University of Brasov.

Using of the device brings the following advantages: high productivity, elimination of physical effort, implementation of new welding technologies, eliminates scrap; materials and energy savings, reducing production costs.

Keywords: *device, mechanization, levers, screw, welding.*

1. INTRODUCTION

To perform auxiliary operations of welding technological process using fixture, grip and detachment which provide the process in good condition. Mechanical equipment may be universal for a large number of specialized products or performance of a single landmark. Installations and equipment for fixing and mounting of parts used in all phases of constructions welded technology. Positioning and fastening devices are based on elements of rising up, screw, lever or eccentric.

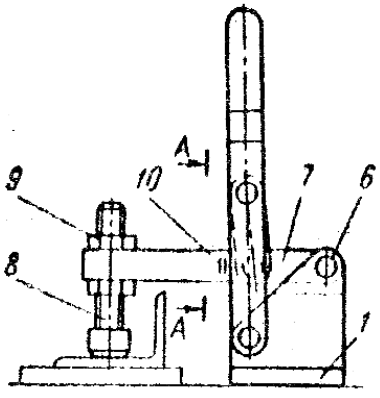
2. THE PRINCIPAL MECHANIZATION OF WELDING OPERATIONS.

2.1 Lever devices.

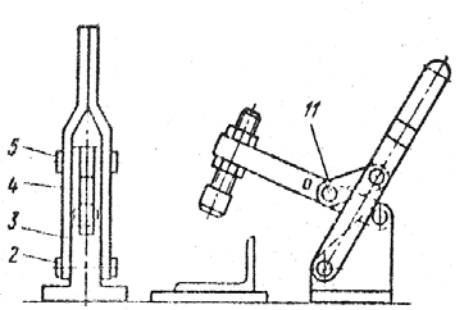
It is used in a wide variety of construction schemes and is widely used because of rapidity of action. Clamping action occurs after the passage lever in neutral. Figure 1 shows a manual lever clamps articulated:

a) working position, b) initial position.

Section A-A



a) working position



b) initial position

Figure 1

Figure 1 shows the clamping element consisting of a basic body which, through the joints, was mounted on axis 2 and 3 and arm lever 7 on the ax 6. Lever arm and the ax are interrelated with plates 4, mounted on the axes 5 and 11. At the end of the lever 7 is mounted screw press 8, whose length is adjusted by nuts 9. On the left arm movement, the plates 4 push the lever 7 and screw 8 hit the piece. When the arm is moving opposite, the lever rotates around the axis 6, the screw is up and release the piece.

In the locked position, the longitudinal axis of the arm has to overcome the vertical position. Gathering of the piece is done when the arm 3 makes with the plates 4 a relatively small angle. Arm race is limited with help of pawl 10. Because the variation of the work piece thickness substantially change the angle of the arm 3 and plates 4, then the screw 8 size it must be adjusted whenever needed. Otherwise it is possible dissolution of the levers articulated clamping elements limiting their use.

In Figure 2 and 3 are a series of clamping devices with levers made and used in the Transylvania University laboratory.

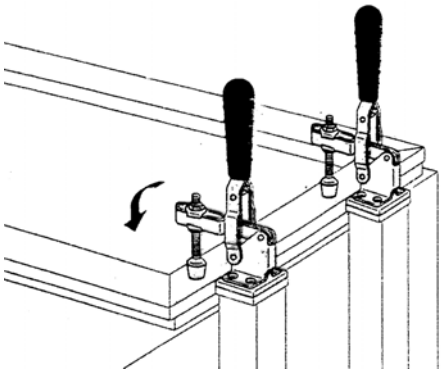


Figure 2

Figure 3

2.2 Sliding clamps with piston .

The device is making one side squeezing on the work pieces welded with the actions of system with the piston in the figure 4. In figure 5 you can see the lever clamps and clamping piston device.

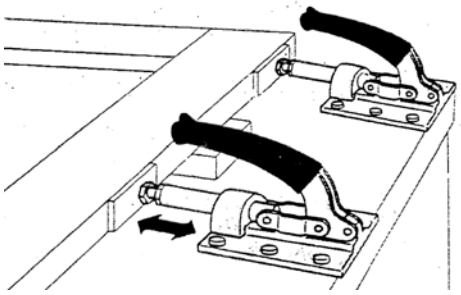


Figure 4

Figure 5

2.3 Elements with screw clamping.

These devices have a wide use in tight fitting and welding devices because of universality, safety in operation, simplicity of construction and the forces decrease compared with raising the necessary forces. The disadvantage consists in reduced productivity of assembly, threads in this vulnerability

results in welding metal splashes and wearing the threads. To calculate the clamping screw elements may use the following relationship is indicative of sizing the diameter of the screw:

$$d1 = \sqrt{\frac{1.27 * Q_2 * z}{\sigma_a}}$$

Where:

Q_2 - is gathering force, considered the action screw axis water in kg/f;

z - coefficient whose value is 1.4 for the screw with pallet and 2 screw without pallet;

σa - permissible compressive stress in kg f/mm^2

The d1 diameter value obtained is rounded to the next higher standard diameter. Then determine all other dimensions of the screw. Screw length needed depends on the race. Screws that require a great effort working on additional account verification torsion. When necessary, check stranger force developed using the following formula, ball-head screw set for driving and pallet :

$$Q_2 = \frac{P * l}{[r_m * \tan(\alpha * \varphi) + \frac{1}{2}\mu * D]}$$

Where:

l – length of the handle, in mm;

rm - the average radius of the screw in mm;

α - angle of inclination of the thread;

φ - angle of helical low friction surface;

μ - coefficient of sliding friction on the front surface of the screw;

D - diameter of the ring of contact between screw and pallet, in mm;

Figure 7 shows a clamping device screw angle to 90 degrees. The advantage is that this device is mounted on a screw joint allows positioning at 90 degrees to parts of different thicknesses.

Figure 6

Figure 7

The device is made of aluminum, the mobile-oriented and driven by a ball joint tightening a screw.

3. Applications

Figure 6 is shown the device to capture two pieces to be welded. Gripping is made between both fixed and mobile jaws with clamping screw.

Mechanization devices used in this paper are special welding processes such as MIG MAG welding, arc welding.

In Figure 7 the device is to perform a takings corner angle 90 degrees, which allows the combination of two pieces of different thicknesses. Raising achievement is movable jaw operated by a screw.

4. Conclusions.

Clamping devices and clamping screw levers have a wide application in welded constructions because they are easy to use.

Mechanization devices can be defined as methods to analyze, organize and manage the means of production to achieve optimal utilization of all productive resources, mechanical, materials. The ultimate objective is to save human efforts mechanization.

5. References:

[1] TRIF, I., Mechanization, automation, welding processes robotization, Ed.Universitatea Transilvania Brasov 1989.

[2] GLITA, Gh., MACHEDON – PISU, T., MILOS, L., Design for welding devices, Ed.LUX LIBRIS Brasov 1997.

[3] TACHE V., BRAGARU A. DEVICES FOR MACHINE - TOOLS. ORIENTATION AND DESIGN SCEMES OF THE SEMI-FIXING, Ed. TEHNICA, Bucuresti, 1980.

[4] Tache V., Ungureanu I., Bragaru A., Gojinetchi N., Marinescu I., Gherghel N., Sutea V., Drutu S., CONSTRUCTION AND OPERATION OF DEVICES, Ed. Didactica si Pedagogica, Bucuresti, 1982.

[5] STANESCU I., TACHE V., DEVICES FOR MACHINE TOOLS DESIGN CONSTRUCTION, Ed. TEHNICA, Bucuresti, 1978.

„ACKNOWLEDGEMENT: This paper is supported by the Sectoral Operational Programme Human Resources Development (SOP HRD), ID76945 financed from the European Social Fund and by the Romanian Government