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(54) **The method of removing rivets especially for magnetic-impulse installation for riveting with heating**

(57) The method of removing rivets, especially by means of magnetic - impulse riveting installation with heating, **characteristic in that**, in the first stage, on the both sides the device clamps around the clapped rivet, then the contacts of device are connected to the endings of rivet, in the second stage, the rivet is heated up to a

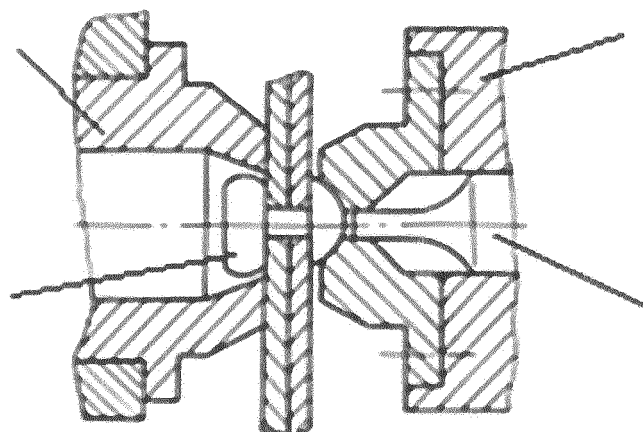
temperature at least 500 ° C, preferably 600-700 ° C, next the rivet is removed by the use of a punch, then the punch and touching elements are cooled with preferably compressed air, wherein the removal of the rivet is made automatically.

the clamp of jaw

a replaceable strap

a rivet

a punch



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## Description

**[0001]** The present invention is the method of removing rivets especially for magnetic-impulse installation for riveting with heating.

**[0002]** From the polish patent no. 359889 is well-known a tubular rivet with a core and a single-riveting method, especially sheet metal. The tubular rivet with a core is equipped with a tubular body with a flat surface on one of its endings and a flange on the other ending, and with core with shank, which is placed in the body, provided with head on one of its endings, touching the end of the body with a flat surface. The shank of the core is provided with a weakened area, located close to the conical surface between the outer surface of the head and the shank of the core, which causes the appearance of the axial compound force which pulls the shank of the core, pressing the body of rivet and a radial compound of the force, expanding the ending of the rivet body. The head of the core has an outer diameter bigger than the outer diameter of the rivet body by 4% to 9%. The present invention also provides a method of one-sided riveting, in particular sheet metals with the help of a tubular rivet, characteristic in that, the opening in the riveted sheet metals, on the inaccessible side to the operator, is provided with a conical widening, into which the ending of the rivet body is pressed forming rivet point, which does not protrude from the sheet metal surface.

**[0003]** From the polish patent no. 345965 presents a device which is well-known to one-sided riveting equipped with a set, tearing the core of rivet, placed in the body of the head of the device, in combined with a hydraulically activated piston which tears the clamping sleeve, surrounding jaws, clamping the core of rivet, pressed against the clamping piston by means of a clamping sleeve. Between the clamping piston and the tearing piston, there is pressure chamber, connected with the port of compressed air by the means of a control unit.

**[0004]** From the polish patent no. 377909 is well-known a riveting head. The present invention is the riveting head, forming riveted joints in a rotary manner for inseparable joining of parts through the use of an external drive unit for rotary and advancing motion to exert pressure of the punch. The riveting head is provided with a body in the form of a cylinder with a grip, inside which the punch is seated eccentrically relative to the longitudinal axis, under the angle  $\alpha$  within the range of  $4 \div 6^\circ$ , optimally under the angle of  $\alpha = 5^\circ$ . The punch is supported in a rotational manner on a needle rolling bearing and lengthwise on a thrust spherical component, and on the face side of the body it is closed with a seal and a seating ring.

**[0005]** From the international patent no. WO 2013/053350 A1 is well-known the invention relating to the realisation of many riveted joints along the surface of the processing object, in particular a riveting device, consisting of a tooling device which is controlled by the control data of tool, for forming rivets with a conical head

in the openings of the processing product, the openings and head are formed to adjust rivets with the conical head, through the use of programmable controlling device for transmitting data which control the tool for tool device and an optical measuring device for optical detecting of surface of processing object and for providing data to sensor. In order to ensure the quality and durability during the rivet connection through the use of a rivet device, the control device is configured according to the invention in order to evaluate the sensor data, to obtain the geometrical data which comprise at least one geometrical parameter which is a conical opening that has already been formed, and depending on the result of the evaluation of geometrical data, if necessary, it is allowed to carry out the correction of control data of tool for later formulation of conical endings.

**[0006]** From the international patent application no. WO 2007/090682 A2 is well-known a riveting gun and a device for installing the rivet. The gun consists of the head of the rivet, a rivet with a flange at one ending and a tip of rivet at the other end. The body of the rivet has a cavity in the shape of the opening on the section of the sleeve. As the other riveting guns, this gun carries out shot about percussive activity with the help of its end of rivet to the opening in two sheets, which must be connected with itself, until the flange of rivet sits down on the upper surface of a front upper layer.

**[0007]** From the international patent application no. WO 03/061869 A1 is well-known an automatic device for cutting rivets, which consists of a matrix with a central mandrel, taking the hollow part in the part of limb with automatic cutting of rivet, the body of matrix has a sunk part for directing the deformation of the ending of limb for the automatic cutting of rivet in the radial external direction, formed on the external peripheral part of the centre mandrel, wherein the centre pin and the body of matrix are movably connected to one another along the direction of the axis of the mandrel facing the punch, and the spring of panel, where the aligning mandrel is moving against the body of the nozzle so that the automatically cut rivet is pressed by the punch, is carried out at sharp parts, and the tip of the piercing of limb starts clamping an element on the receiving side, through the spindle, it is possible to bring into contact with the side surface of the tightened matrix element on the receiving side, the limit of direction of moving of pointed elements can be mitigated or eliminated.

**[0008]** The purpose of the invention is to develop the new method of removing rivets especially for magnetic-impulse installation for riveting with heating.

**[0009]** According to the invention, the method is that, in the first stage, on the both sides the device clamps around the clapped rivet, then the contacts of device are connected to the endings of rivet, in the second stage, the rivet is heated up to a temperature at least  $500^\circ\text{C}$ , preferably  $600\text{--}700^\circ\text{C}$ , next the rivet is removed by the use of a punch, then the punch and touching elements are cooled with preferably compressed air, wherein the

removal of the rivet is made automatically.

**[0010]** The object of the invention was shown in the example on the picture, on which heating the rivet to the required temperature and removing the rivet by the punch were shown.

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### **An example**

**[0011]** The method of removing rivets from different alloys during the repairing the riveted sets of machines consists of the following operations:

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- both sided clamping of the device around the clapped rivet
- connecting the contacts to the endings of the rivet in order to heat the clapped part of the rivet
- heating of the rivet to the temperature of 650° C and removing the rivet by the use of the punch (the picture)

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**[0012]** Removing of the rivet is made automatically after reaching the required temperature. Cooling the punch and touching elements by the use of compressed air.

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**[0013]** The industrial device for removing the rivets consists of: a very fast electro-impulse driver, placed on a hung clamp, the battery and technological tooling for placing and turning around a product in comfortable working position. The heating temperature of the rivet is controlled by the automatic tracking system. For the configuration of equipment and its operations in the control system, the manual and automatic mode is provided.

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**[0014]** Process characterises as the process of quality and increased productivity.

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### **Claims**

1. The method of removing rivets, especially by means of magnetic - impulse riveting installation with heating, characteristic in that, in the first stage, on the both sides the device clamps around the clapped rivet, then the contacts of device are connected to the endings of rivet, in the second stage, the rivet is heated up to a temperature at least 500 °C, preferably 600-700 °C, next the rivet is removed by the use of a punch, then the punch and touching elements are cooled with preferably compressed air, wherein the removal of the rivet is made automatically.

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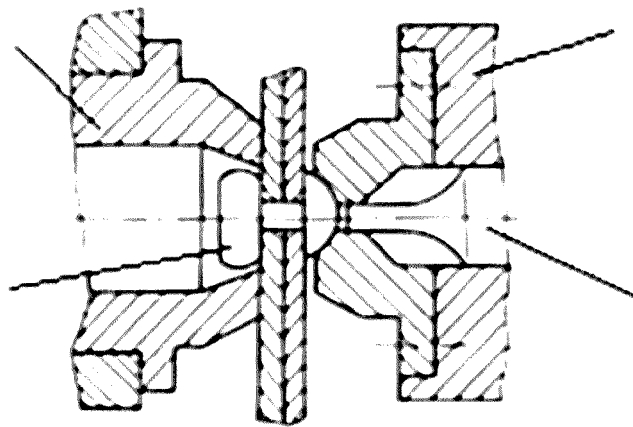
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the clamp of jaw

a replaceable strap

a rivet

a punch





## EUROPEAN SEARCH REPORT

Application Number  
EP 14 46 0123

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                          |                                                     |                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Citation of document with indication, where appropriate, of relevant passages                                            | Relevant to claim                                   | CLASSIFICATION OF THE APPLICATION (IPC)                  |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | US 3 576 064 A (BRACKIN EARL R)<br>27 April 1971 (1971-04-27)<br>* column 2, line 35 - column 44; figures 1-4 *<br>----- | 1                                                   | INV.<br>B21J15/50<br>B21J15/08<br>B21J15/24<br>B21J15/02 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                          |                                                     | TECHNICAL FIELDS SEARCHED (IPC)                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                          |                                                     | B21J                                                     |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                          |                                                     |                                                          |
| Place of search<br>Munich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                          | Date of completion of the search<br>28 January 2016 | Examiner<br>Augé, Marc                                   |
| <b>CATEGORY OF CITED DOCUMENTS</b><br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                                          |                                                     |                                                          |

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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- PL 377909 [0004]
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