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(54) **HORIZONTAL AXIS HYDRAULIC PRESS WITH HIGH FLEXIBILITY**

(57) Hydraulic press with horizontal axis for the production of metal carpentry components, which are bound through compression, comprising a basement (10) to which an adjustable matrix-holder frame (11) and an adjustable punch-holder frame (12) are constrained, said frames (11, 12) being positioned such that they have two opposite surfaces (111, 121) on which there are installed a punch and a matrix, respectively, to carry out bending operations of metal sheets, characterized in that said ma-

trix-holder frame (11) is constrained to said basement (10) by means of bolted couplings realized on a hole (16) with constant pitch, such that its surface (111) opposite to the punch-holder frame (12) can be approached or spaced apart in horizontal direction with respect to the opposite surface (121), thus adjusting the machine gap, i.e. the space useful for the introduction of the workpiece, without compromising the machine bending stroke.

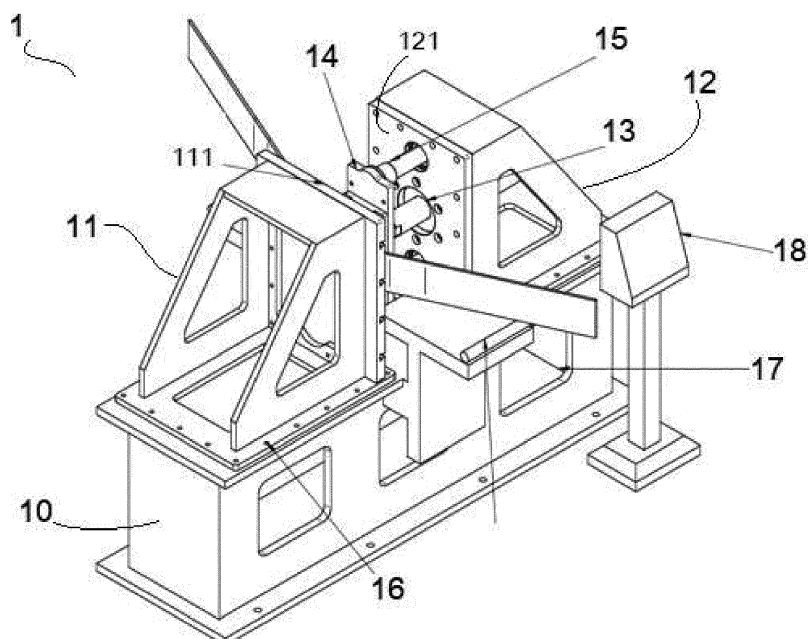


Fig. 1

Description

[0001] The present invention relates to a hydraulic press with high flexible horizontal axis, for production of metal carpentry components, which are bound through compression.

[0002] In realizing components for carpentry, which are bound through compression for structural applications in mechanical field, the most critical step from a technological point of view is the production of single components, characterized by trimming and bending operations which are peculiar to the geometric features of the used semi-finished product (constituent material, thickness, width and length of the used flat rolled section).

[0003] Currently, the production of such components is obtained by means of a sequence of trimming and bending operations on suitable machines which use matrixes and punches suitably realized for carrying out the single operations with remarkable use of resources in terms of costs sustained for the production of the single tools and for their exchange on the used machine tools (bending machine, trimming hydraulic press). Therefore, the operational solutions traditionally used are characterized by poor tools flexibility and by consequent high production costs and times.

[0004] Aim of the present invention is to provide a hydraulic press with high flexible horizontal axis, able to optimize production times and costs in the production of components bound through compression and allowing to make the workpieces customization easier.

[0005] This has been obtained thanks to a study first and an implementation then of specific solutions relating to bending and trimming of flat rolled sections by means of a working flexible system able to extremely reduce cycle times and costs.

[0006] The hydraulic press (1) according to the invention comprises a basement (10) to which an adjustable matrix-holder frame (11) and an adjustable punch-holder frame (12) are constrained.

[0007] The two frames (11, 12) are positioned such that they have two opposite surfaces (111, 121) on which there are installed a punch and a matrix, respectively, to carry out bending operations of metal sheets.

[0008] Saying that the two frames (11, 12) are adjustable means that:

- (i) the matrix-holder frame (11) is constrained to the basement (10) by means of bolted couplings realized on a hole (16) with constant pitch, such that its surface (111) opposite to the punch-holder frame (12) can be approached or spaced apart in horizontal direction with respect to the opposite surface (121), thus adjusting the machine gap (i.e. the space useful for the introduction of the workpiece) without compromising the machine bending stroke;
- (ii) the adjustable punch-holder frame (12) is installed on guide, support and abutting systems, adjustable in the three axes of reference.

[0009] It is to be specified that the just described solution has been adopted because all the hydraulic actuators withstand better to transverse stresses if they are not at their maximum stroke. In fact, in the configuration of maximum stroke the inner supports between rod and cylinder are closer, and so less able to withstand bending moments due to transverse components of withstanding forces. The fact that the machine can adjust the working gap independently of the effective stroke of the piston allows the piston not to work at its own maximum stroke regardless of the workpiece dimensions.

[0010] Moreover, the adjustable matrix-holder frame (12) is provided with a matrixes-support with standard hole which allows the installation (and substitution according to needs) of many types of matrixes, able to carry out workings with different profiles on rolled sections with different thickness and different material. Similarly, the thrust system made up of piston (13) and punch-holder (14) is realized such that it can be mounted on the adjustable punch-holder frame (12).

[0011] Also the punch-holder (14) is provided with standard couplings which allow the use of punches of different type, for carrying out the most different workings possible.

[0012] The just described architecture allows to modify the horizontal gap without compromising the effective working stroke, since the frame can be moved while keeping the piston (13) in its rest position. Therefore, such embodiment allows that the piston always functions in its optimum stroke range thus allowing it to exert at best the bending force needed for working.

[0013] In other words, when the workpieces change also the useful tools working stroke is kept constant while changing profiles to be machined.

[0014] As a way of example, according to an embodiment the machine can be provided with pistons able to exert a maximum force of 80 tons when supplied with a pressure of 250 bar.

[0015] The architecture of the flexible trimming and bending system is completed by mounting the punch on high precision guides with balls re-circulating system (15) which guarantee precision and repetitiveness of the working steps.

[0016] Preferably, the press with horizontal axis according to the invention is also provided with a system of fixed and mobile stops, as well as movement and pressure transducers. In this manner it is possible to set bending parameters in equipment step and then to keep them constant for the whole production cycle, for each element constituting the production batch.

[0017] According to a preferred embodiment the fixed stops are extra-stroke sensors, and are contact sensors. The mobile stops can be realized by contact sensors or proximity sensors, and are configured to be moved by means of a rack system according to the bending stroke which the machine has to carry out for each workpiece; preferably the movement transducers are instead magnetic sensors with magnetic stripe reading, connected to

a digital display where it is possible to read the movement of the machine.

[0018] The press comprises further other elements needed for its functioning and known at the state of the art, such as for example an electro-hydraulic gearcase (17) for piston controlled actuation and a control panel (18) by means of which the operator can program and control all the machine operations. Finally, it is to be specified that the machine has only one movement axis which is the one of the piston of the press, while the piece abutting systems are adjusted by means of racks.

Claims

1. Hydraulic press with horizontal axis for the production of metal carpentry components, which are bound through compression, comprising a basement (10) to which an adjustable matrix-holder frame (11) and an adjustable punch-holder frame (12) are constrained, said frames (11, 12) being positioned such that they have two opposite surfaces (111, 121) on which there are installed a punch and a matrix, respectively, to carry out bending operations of metal sheets,
characterized in that
said matrix-holder frame (11) is constrained to said basement (10) by means of bolted couplings realized on a hole (16) with constant pitch, such that its surface (111) opposite to the punch-holder frame (12) can be approached or spaced apart in horizontal direction with respect to the opposite surface (121), thus adjusting the machine gap, i.e. the space useful for the introduction of the workpiece, without compromising the machine bending stroke.
2. Hydraulic press with horizontal axis according to claim 1, **characterized in that** said adjustable punch-holder frame (12) is installed on guide, support and abutting systems, adjustable in the three axes of reference.
3. Hydraulic press with horizontal axis according to claim 1 or 2, **characterized in that** said adjustable matrix-holder frame (12) is further provided with a matrixes-support which allows the installation of many types of matrixes, and **in that** also the punch-holder (14) is provided with couplings which allow the use of punches of different type, for carrying out the most different workings possible.
4. Hydraulic press with horizontal axis according to any one of the preceding claims, further comprising a system of fixed and mobile stops, as well as movement and pressure transducers, configured such that it is possible to set bending parameters in equipment step and then to keep them constant for each element constituting the production batch.

5. Hydraulic press with horizontal axis according to claim 4, **characterized in that** said fixed stops are extra-stroke sensors, and are contact sensors, and **in that** said mobile stops are contact sensors or proximity sensors, and are configured to be moved by means of a rack system according to the bending stroke which the machine has to carry out for each workpiece.

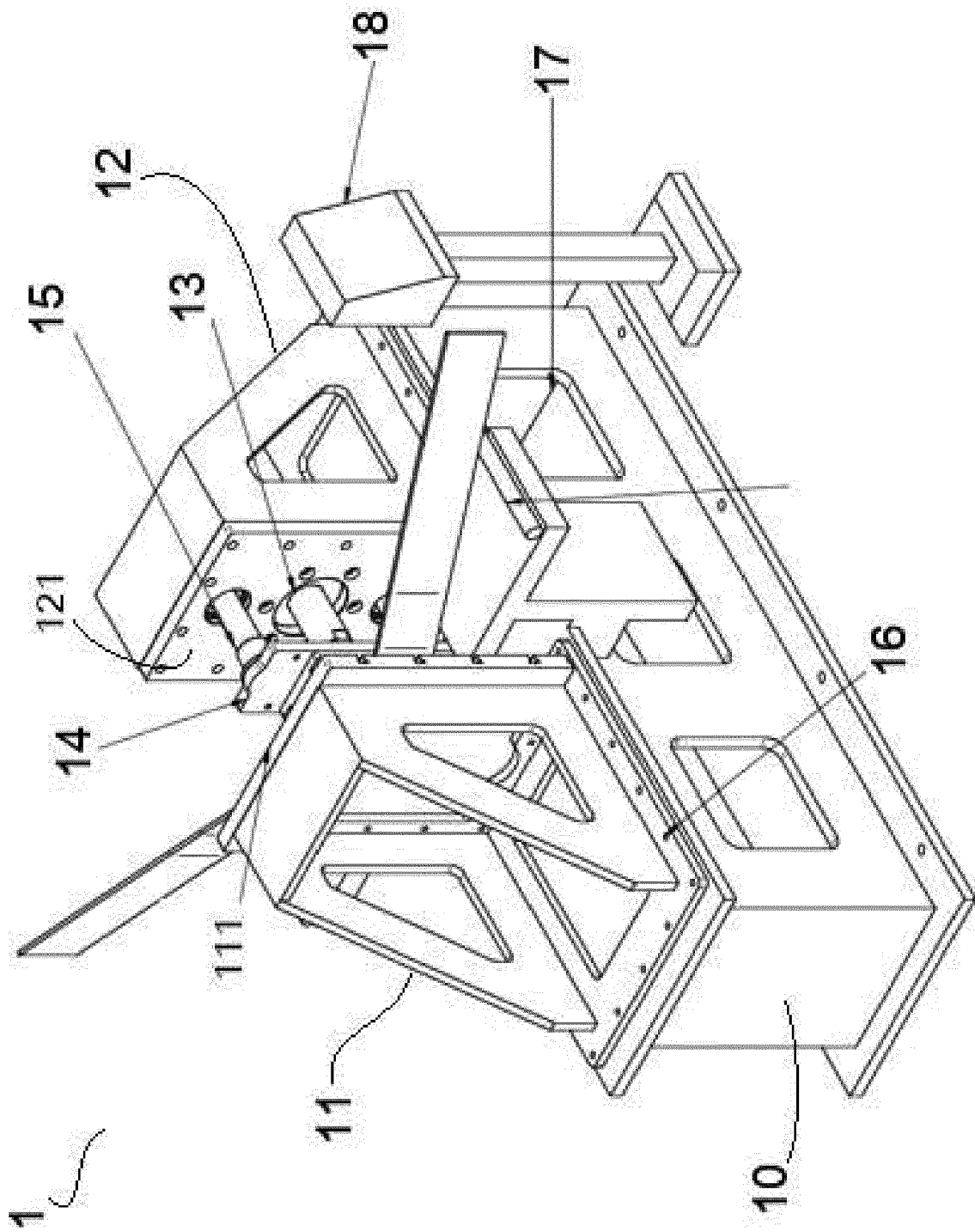


Fig. 1



EUROPEAN SEARCH REPORT

 Application Number
 EP 17 20 6327

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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)
X	CN 204 640 845 U (SHI YAN CHUANGLI FORGING AND PRESSING EQUIPMENT LTD) 16 September 2015 (2015-09-16) * figures 1,2 *	1-5	INV. B21D5/00 B21D22/00 B30B1/00
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			TECHNICAL FIELDS SEARCHED (IPC)
			B21D B30B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 June 2018	Examiner Cano Palmero, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 17 20 6327

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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14-06-2018

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