(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 466 677 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.10.2004 Bulletin 2004/42

(51) Int Cl.[7]: **B21D 5/02**, B30B 1/02

(21) Application number: **04006800.9**

(22) Date of filing: **22.03.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(30) Priority: **09.04.2003 IT pr20030027**

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(54) Device for handling the upper moving table carrying the punch in a bending press

(57) The invention deals with the field of bending presses, and, more precisely, deals with a device for handling the upper table moving along guiding pillars and carrying the punch. For every table guiding pillar, the device provides for a main lever (10) hinged in a point that is substantially axial with its related guiding pillar and whose driving arm (10a) is hinged to means (9) sliding along a rod (8) hinged to the upper table. The lever resisting arm (10b), whose length is approximately 8-10 times shorter that the driving arm length, rotates a crank (12) connected through an eccentric (13) or a connection rod to a connecting rod (14) that transmits the translating motion to the upper table.

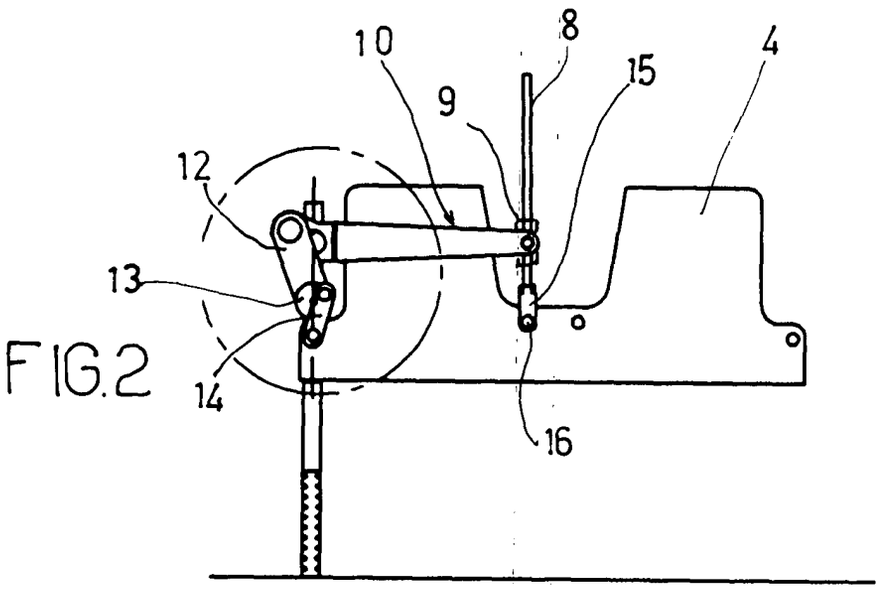

FIG.2

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Description

[0001] Object of the present invention is a device for handling the upper moving table carrying the punch in a bending press.

[0002] As known, the bending presses have a structure that is mainly composed of a lower table on which tools (matrix dies) rest and an upper table that supports the punches to perform a bend on the sheet that is placed onto the matrix die.

[0003] The upper table is moved by thrust actuators consisting in two hydraulic cylinders controlled by an hydraulic unit.

[0004] The thrust actuators must carry out an approaching stroke of the two tables at high speed in order to reduce the time necessary for approaching to a minimum.

[0005] In the currently marketed bending presses with hydraulic actuators composed of two cylinders, the quick approaching phase exploits the force of gravity in order to make the upper table fall; during the pressing operation, the slow speed is realised by suitably dimensioning flow rate and pressure of the hydraulic unit pump.

[0006] The handling system of the hydraulic type has several inconveniences, among which:

- due to the internal friction effect of thrust cylinders, the upper table free fall occurs with very low accelerations, with consequent loss of time;
- the hydraulic system provides for the use of high amounts of oil with great burdens for user customers as regards maintenance, installation and spent oil disposal.

[0007] Object of the present invention is completely removing all inconveniences due to the use of an hydraulic system by realising an handling device of the upper table of the electro-mechanical type.

[0008] This and other objects are fully obtained by the device of the present invention, that is characterised in that it provides what is stated in the below-listed claims, and particularly in that, for every pillar guiding the vertical translation of the punch-carrying upper table, it comprises a main lever axially hinged to the pillar and whose driving arm is hinged onto means translating along a bar hinged to the head and it further comprises a crank, a connecting rod, hinged to the upper table, being hinged to the crank eccentric, the crank being rotated by the main lever resisting arm.

[0009] These and other characteristics will be better pointed out by the following description of a preferred embodiment, shown merely as a non-limiting example in the enclosed tables of drawing, in which:

- figure 1 schematically shows the bending press in a front elevation view
- figures 2 and 2A show the press and its related detail with the handling device in its top dead center in the approaching starting step;
- figures 3 and 3A show the press and its related detail in the speed change point during the pressing starting step;
- figures 4 and 4A show the press and its related detail in the pressing ending point and at the beginning of the return step to the top dead center.

[0010] With reference to figure 1, number 1 shows a lower table of a bending press designated as a whole as 2.

[0011] The lower table has a matrix die 3 on which a sheet foil to be bent is rested.

[0012] Number 4 designates an upper table that can vertically translate along guiding pillars 5 in order to go from a top dead center to a bottom dead center and vice versa.

[0013] The tool or punch 6, adapted to press onto the sheet next to the below matrix die to perform the bending, is assembled onto the upper table.

[0014] Number 7 designates two perfectly identical devices for moving the upper table.

[0015] Each one of said devices comprises a threaded bar 8 that can be rotated by an electric ratio-motor, not shown.

[0016] A scroll 9, adapted to translate along the threaded bar when this latter one is rotated, is inserted on the threaded bar.

[0017] The threaded bar rotates free with respect to a U-bolt 15 hinged to the upper table in a central position 16 with respect to the guiding bars.

[0018] The threaded bar is a rod hinged to the upper table along which displacing means of a main lever 10 car slide.

[0019] The driving arm 10a of the main lever 10, hinged in 11 next to the driving pillar 5 axis, is hinged to the scroll.

[0020] A crank 12 is hinged to the resisting arm 10b of the main lever 10, such crank 12 having an eccentric 13 to which a connecting rod 14 is hinged, such connecting rod transforming the crank rotating motion into a rectilinear translating motion and transmitting this latter one to the upper table in the way that will be described below with reference to figures 2, 2A, 3,3A ,4 and 4A.

[0021] With reference to figures 2 and 2A, the upper table is in the top dead center in the starting position of the quick approach step.

[0022] By rotating the threaded bar, the upper table of the bending press will perform the quick descent step, such descent being controlled by the threaded bar and by the connecting rod-crank system, till the connecting rod is taken into a substantially vertical position axial with the driving risers. During this quick descent step, the main lever is not subjected to rotations, but a simple vertical translation by moving its rotating point only, as shown in figures 3 and 3A.

[0023] The pressing step then begins through the action of the main lever that highly reduces the table descent speed, highly increasing the thrust force.

[0024] As can be noted, the two main lever arms are in a ratio of about 8-10 so that a thrust multiplication of this ratio on the table will be obtained.

[0025] A further advantage of the present invention is that the two threaded bars directly push onto the upper table in a substantially central position, thereby reducing the table flexure, during the pressing step.

[0026] Moreover, since two different mechanical systems are provided for the two table movements (quick and slow ones), from the machine safety point of view, active optical barriers can be provided for the high approaching speed and the lack of protection at the slow pressing speed.

[0027] The threaded bar with scroll could be replaced by other translating means of the main lever resisting arm, such as, for example a slider sliding along a rack.

[0028] According to a possible embodiment variation, not shown, the eccentric could be replaced by a rod hinged on one side to the connecting rod and on the other side to the crank.

[0029] Obviously, the ratio between main lever driving arm and resisting arm can change depending on the thrust that has to be exerted onto the upper table.

Claims

1. Device for moving the movable upper table carrying the punch of a bending press and slidable along two guiding pillars (5) **characterised in that** it comprises, for every guiding riser:

   a main lever (10) hinged next to the vertical axis of its related driving pillar and whose driving arm (10a) is hinged to means translating along a rod hinged to the upper table;
   a crank (12) hinged, through an eccentric (13), to a connecting rod (14) adapted to transmit the rectilinear translating motion to the upper table, said crank being rotated by the resisting arm (10b) of the main lever (10).

2. Device according to claim 1, **characterised in that** the translating means are composed of a scroll (9) slidable along a threaded bar rotated by a ratio-motor.

3. Device according to claim 1, **characterised in that** the two threaded bars are placed substantially in a central table area with respect to the table driving pillars in order to reduce the table flexure during the pressing step.

4. Device according to claim 1, **characterised in that** the ratio between main lever driving arm and main lever resisting arm is about 8- 10 times.

5. Device according to claim 1, **characterised in that** it comprises a joint connection rod placed between crank (12) and connecting rod (14).

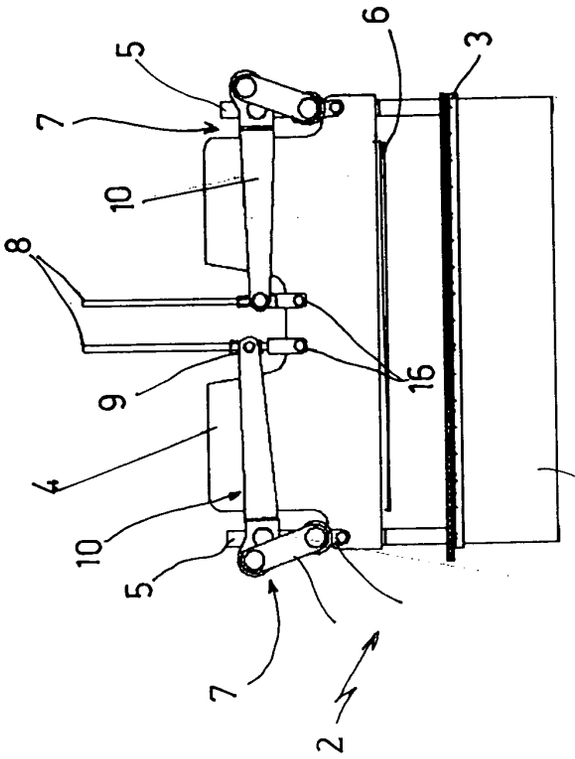

FIG.1

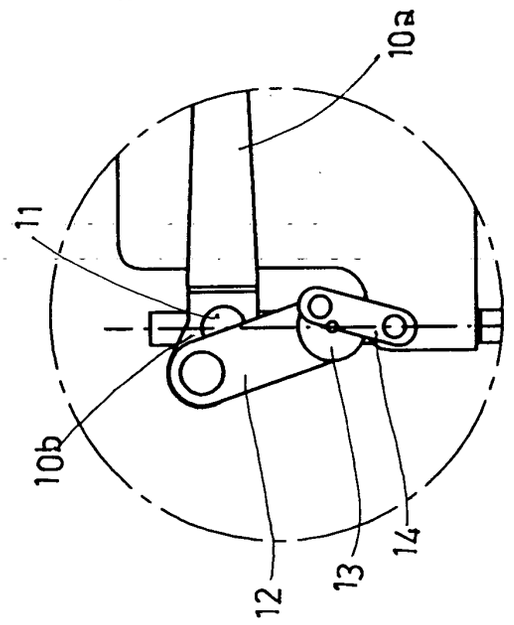

FIG.2A

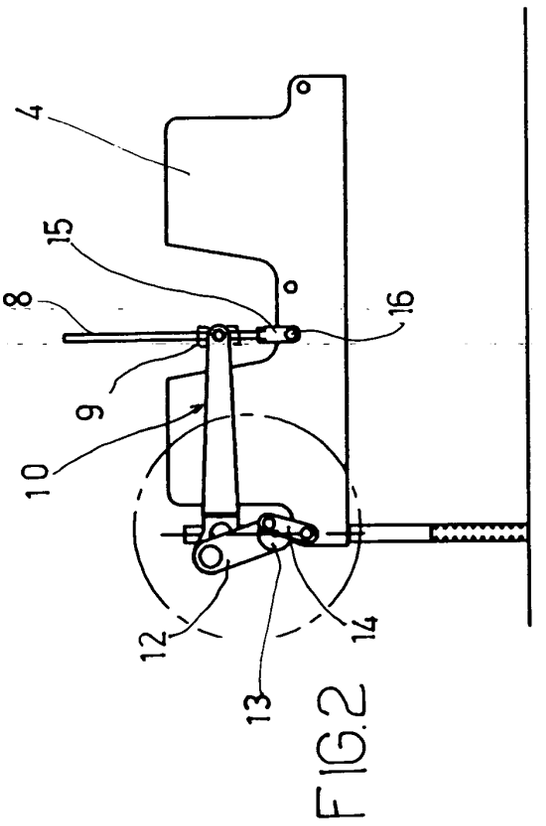

FIG.2

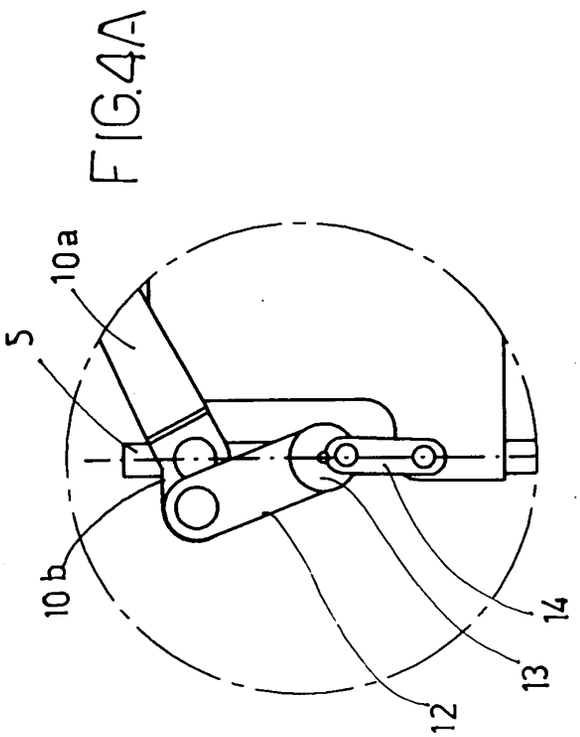

FIG.4A

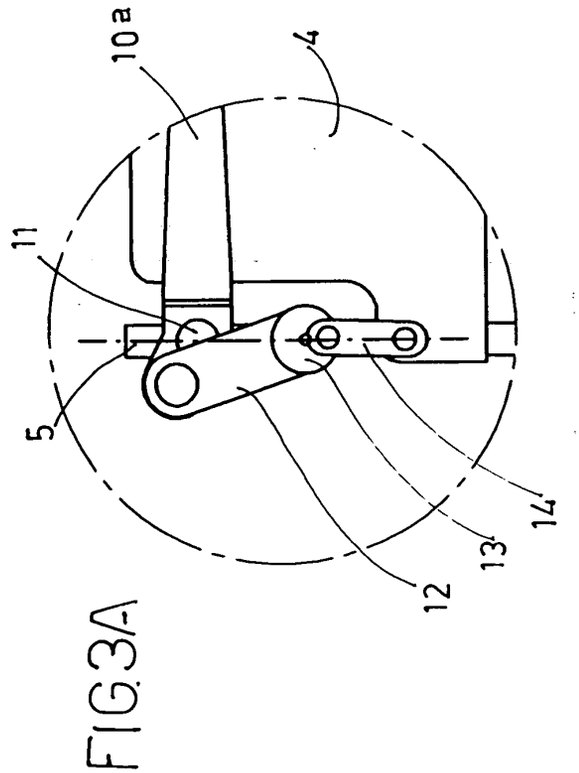

FIG.3A

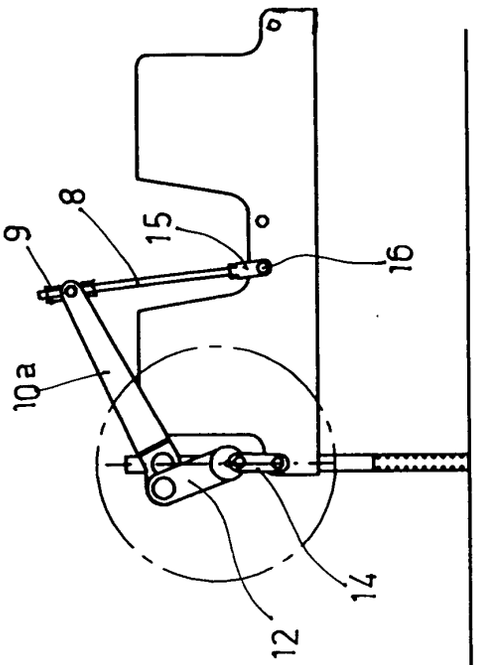

FIG.4

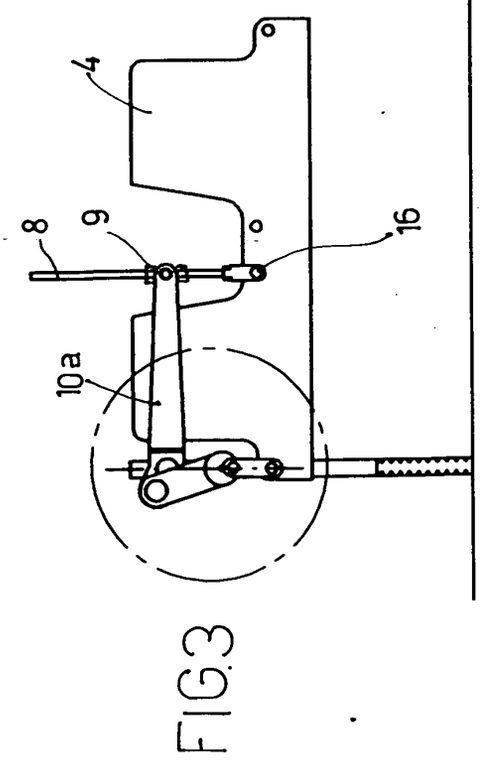

FIG.3

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EUROPEAN SEARCH REPORT

Application Number
EP 04 00 6800

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 845 334 C (KIESERLING & ALBRECHT) 31 July 1952 (1952-07-31) * the whole document *	1	B21D5/02 B30B1/02
A	GB 991 095 A (EDVARD KROGSGAARD IVERSON; JORGEN THORKILD PEDERSEN) 5 May 1965 (1965-05-05) * page 2, lines 31-52; figure *	1	
A	SE 448 686 B (DAHLSTROM CLAES INGE SIGFRID) 16 March 1987 (1987-03-16) * figures 1-6 *	1	
A	US 6 240 758 B1 (NAGAKURA SEIJU) 5 June 2001 (2001-06-05) * column 6, lines 24-29; figures 1-3,11 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B21D
B30B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 June 2004	Meritano, L

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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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04-06-2004

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