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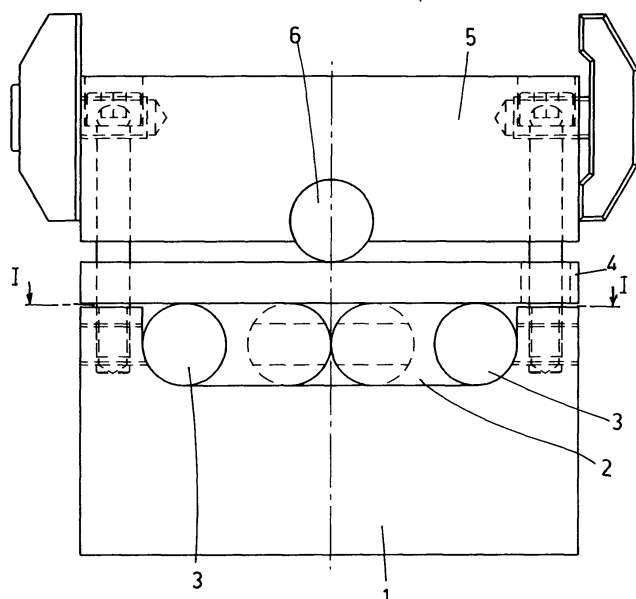
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(54) **Supplementary tool-holding table for compensating the flexure of the upper or lower table of a bending press**

(57) The invention deals with the field of bending presses and more precisely with a supplementary tool-holding table to compensate the flexure of the lower or upper table of the press itself. The supplementary table is adapted to be abutted onto the lower table or the upper table and provides for a bearing base (5) for matrix die or punch tools in the centre of which a circular bar

(6) is inserted that is adapted to operate on an abutment sheet (4) resting onto two round bars (3) whose length is equal to the bending press table. The two bars (3) are inserted into a groove (2) of a bearing base (1) adapted to be housed over the bending press lower table. Means (7) are provided for adjusting the distance between the two bars along the bending line.

FIG.1



Description

[0001] Object of the present invention is a supplementary tool-holding table for compensating the flexure of the lower or upper table of a bending press.

[0002] As known, the structure of a bending press is composed of an upper table carrying a punch and a lower table carrying the matrix die, lower table and upper table being connected by two side shoulders.

[0003] As known, in a bending press, the effect of the necessary force for bending on the structure parts of the bending press is deforming the two tables, upper table and lower table.

[0004] The deforming effect of the two tables, that is greater in their centres and is cancelled when reaction points or pushing points of hydraulic actuators are reached, is causing the penetration of the punch into the matrix die not to be constant along the bending line, and this generates an angular bending; more precisely, the sheet has a bending angle that is lower on its sides and more open in its centre.

[0005] In order to solve this inconvenience, several systems have already been built, that can substantially be divided into two groups:

- mobile systems with hydraulic cylinders or wedge-shaped mechanical systems to impress a deformation to the lower or upper table for compensating the flexure of said tables;
- passive mechanical systems in which the lower table is composed of a sandwich of three tables with which flank reactions are taken to the centre in order to flex the central table in parallel with the upper table.

[0006] These briefly described systems have some inconveniences and more precisely passive mechanical systems do not allow adjustments depending on flexure of loaded tables, while hydraulic systems are highly complex and costly.

[0007] Object of the present invention is solving the above-stated inconveniences realising a supplementary table that joins an adaptive mechanical system with a system that is able to be adjusted depending on the thrust of actuators of a known type and therefore depending on the necessary force for the bending.

[0008] Said object is fully reached by a supplementary table for compensating the flexure of the upper and/or lower table of a bending press, object of the present invention, that is characterised by what is stated in the below-listed claims, and in particular in that it provides a bearing base of the upper or lower table in which two cylindrical bars are inserted, on which a force transmitting sheet abuts, onto such sheet a cylindrical bar presses that is inserted in a bearing base for matrix die or punch tool.

[0009] This and other features will be better pointed out by the following description, shown merely as a non-

limiting example, in the enclosed tables of drawing in which:

- figure 1 shows the supplementary table in a side view;
- figure 2 shows the supplementary table in a plan view according to section I-I in figure 1.

[0010] The following description will refer to the application of the supplementary table to the lower table of the bending press.

[0011] With reference to the figures, reference 1 designates a bearing base adapted to be housed over the lower table of a bending press.

[0012] A longitudinal groove 2, in which two bars 3 whose circular section and whose length are equal to the bending press table ones, is obtained in the bearing base.

[0013] The diameter of the two bars 3 is slightly greater than the groove 2 depth.

[0014] Above the two bars, and therefore above the bearing base, an abutment sheet 4 is rested in which a central bar 6 bears that is held by a tool-bearing base (matrix die) 5.

[0015] The tool bearing base is mobile.

[0016] The two bars 3 can be approached in the central part of the lower table next to the maximum flexure points.

[0017] In order to make such approach, means are provided that, in the example shown, are composed of dowels 7 that, by reacting against the two shoulders of the bearing base, push said two bars 3 towards the centre.

[0018] Said dowels 7 are mostly concentrated in the central area where the two bars 3 must be as near as possible one to the other.

[0019] The supplementary table therefore operates as follows.

[0020] When the tools press due to the bending force onto the mobile bearing base, the central bar 6 transmits the force to the abutment sheet that is flexed proportionally to the distance of the two reaction bars 3.

[0021] The sheet flexure makes the external parts of the mobile part approach the bearing base more, while centrally the mobile part is not flexed very much due to the maximum approach of the two bars 3.

[0022] This difference in flexure of the extreme parts with respect to the centre compensates for the effect of table flexure.

[0023] The description specifically refers to the lower table compensation, but the system can be used also on the upper table in order to have the maximum compensation of the absolute flexures.

[0024] The means for adjusting the distance between the two bars 3 can be different from the described ones, for example small hydraulic cylinders, provided that they allow adapting the lower and/or upper table flexures to possible geometry variations of the work-piece to be

worked.

[0025] The longitudinal groove 2 in which the bars 3 are inserted can be directly obtained by milling in the upper and/or lower table.

[0026] The bars 3, as well as the central bar, could also have a different section from the circular one, for example they could have a square section but with joined edges that contact the abutment sheet 4 in order not to impair its flexure.

[0027] According to a further embodiment, the two bars 3 can be housed, with a certain clearance, into two different and separate channels converging towards the central part.

[0028] The description specifically refers to a type of bending press in which the thrust actuators are placed at the upper table ends. In other types of presses, the actuators can be placed in a more central position or a single, centrally-placed actuator can be provided.

[0029] In these cases, the reaction bar displacements must be differently configured from the above-described ones and in particular their ends must also be approached.

tance along the bending line.

5. Table according to claim 3, **characterised in that** the adjusting means are composed of small hydraulic cylinders.
6. Table according to the previous claims, **characterised in that** it provides two separate grooves converging towards the centre in which the bars (3) are separately housed.
7. Table according to the previous claims, **characterised in that** the means for adjusting the bars (3) behaviour are such as to allow the bars to assume any configuration depending on the compensation points position.

Claims

1. Supplementary tool-holding table for compensating a flexure of a lower and/or upper table of a bending press, **characterised in that** it comprises:

- a bearing base on the upper and/or lower table of the bending press, in which at least one longitudinal groove (2) is obtained in which two bars (3) are housed whose section is substantially circular and that are as long as the press table or at least as the area that has to be compensated;
- an abutment sheet (4) for transmitting a force placed onto the bars (3);
- a mobile tool bearing base (5) onto which the bending press tools are resting;
- a central bar (6) supported by said tool bearing base and adapted to press onto the force-transmitting abutment sheet.

2. Table according to claim 1, **characterised in that** the bearing base provides for a longitudinal groove (2) whose depth is slightly lower than the reaction bar (3) diameter.

3. Table according to claim 1, **characterised in that** it comprises means (7) for adjusting the reaction bar positions with respect to the central bar along all or part of the table.

4. Table according to claim 3, **characterised in that** said means are composed of adjusting dowels that operate onto said bars in order to adjust their dis-

FIG.1

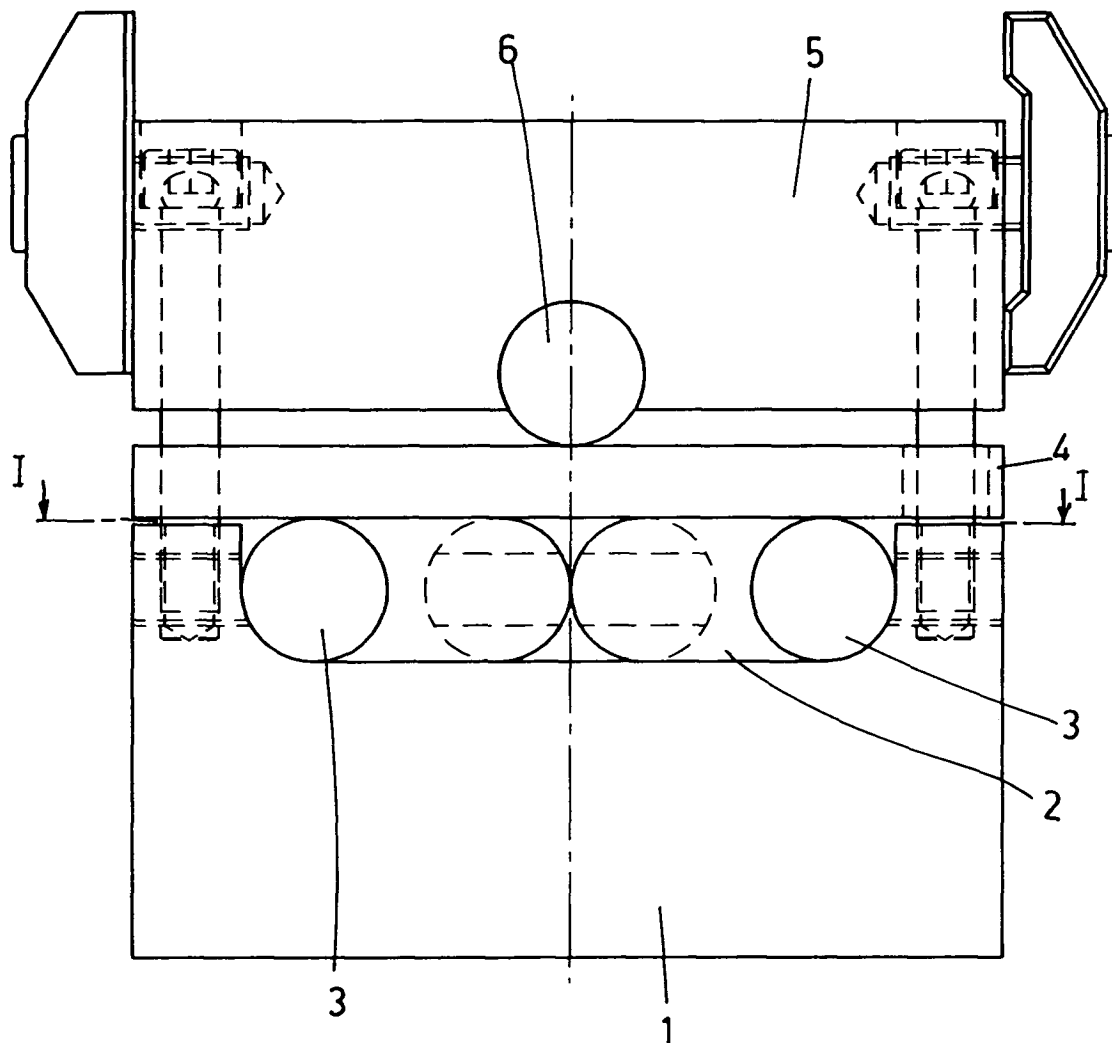
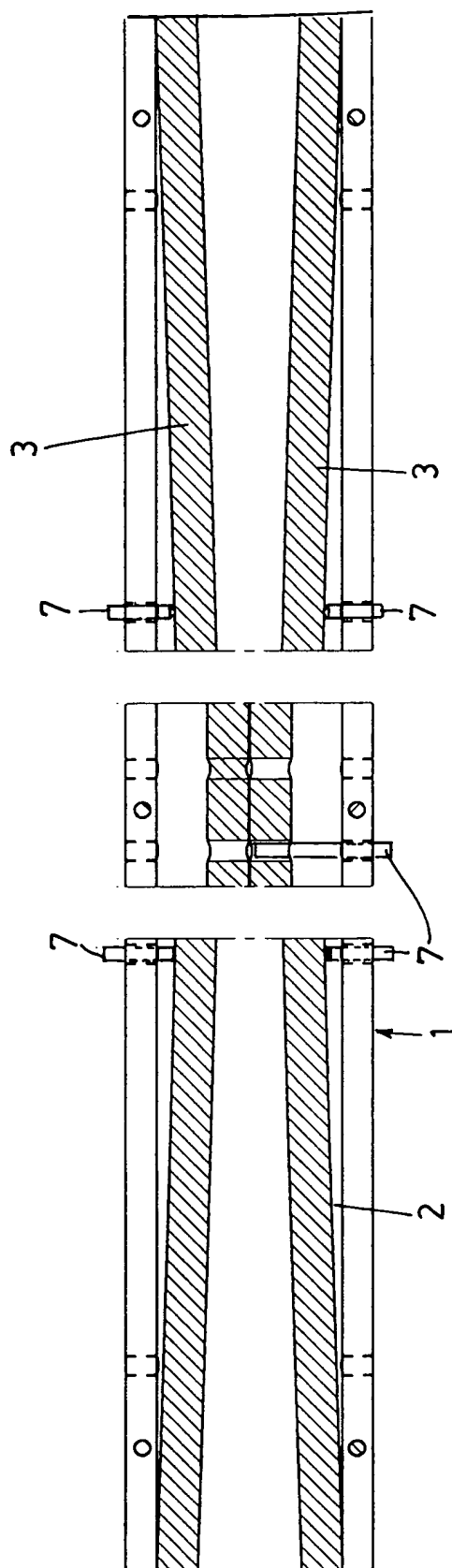


FIG.2





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 00 3238

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)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
Place of search MUNICH		Date of completion of the search 4 May 2004	Examiner Meritano, L
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
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 00 3238

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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