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(54) **Centering method and device for carrying out the same**

(57) In order to improve the centring of a piece (L) on a loading area (60, 62) from which a loader (24) picks it up to bend it with a press brake (22), the piece is moved

from a position in which it arrives in the area to a position in which it has an orientation that is predefined in an obligatory manner.

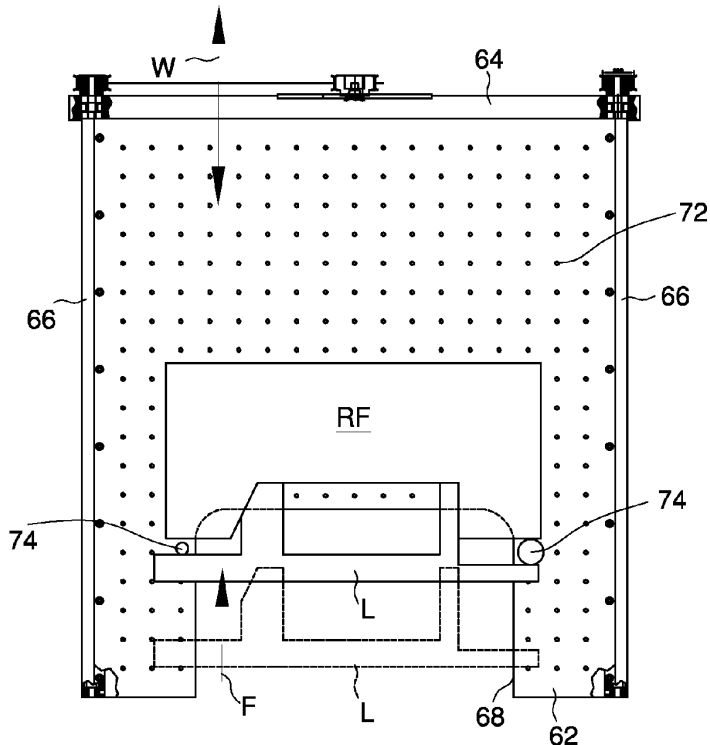


Fig. 4

Description

[0001] The invention concerns a method for centring pieces during the loading of the pieces (in particular metal sheets) in a press brake. The invention also concerns a centring device that carries out the method.

[0002] A press brake is formed by a punch that can move vertically and that is forcibly inserted into a corresponding matrix. See for example the presses in GB784981 and EP0476092.

[0003] Fig. 1 shows a system for bending metal sheets. The press is indicated with reference numeral 10, and a metal sheet is taken with a robotic arm 12 from a loading plane 14 and is transported above the matrix to then be bent by the punch.

[0004] The metal sheets arrive on the plane 14 taken by another robot or loader 16, that takes them from a store 18 and prepares them in a sufficiently arranged manner for the robot 12.

[0005] For cost reasons the robot 12 is "blind", i.e. it takes for granted the position of the piece on the plane 14 and takes it as it is. If the piece on the plane 14 is in the wrong position the bending will be faulty.

[0006] The positioning on the plane 14 can be improved by using an optical piece recognition device, but the costs increase dramatically.

[0007] Moreover, the first manipulation of the robot 16 generates errors and waste products since the piece released on the plane 14 can easily end up positioned with errors.

[0008] The robot 12 is often equipped with suction cups, and the matrix of the press has actuations or calibration supports (very expensive) to reset a precise positioning. Since the suction cups operate well on suitable surfaces, the small pieces (few cm in length) are bent manually in the press, with great risks of personal injury.

[0009] The invention has the main purpose of solving the problem of the imprecise positioning of the piece before taking it to the press.

[0010] The problem is solved by a method according to claim 1.

[0011] The piece, which is usually an object of metal sheet and often flat, is moved from the position in which it arrives in the loading area to a position in which it has an obligatory orientation, i.e. conditioned by external constraints. In the final position the piece has the optimal orientation. Repositioning the piece in the loading area ensures that the robot 12 arranges the piece in the press with maximum precision, eliminating wastage. By equipping the robot 12 with a suitable clamp, small pieces can be bent, which remain perfectly oriented on the loading area without requiring the usual (and very costly) calibration and repositioning means mounted in the press.

[0012] The repositioning in the loading area can be obtained in many ways, for example, with a small manipulator that negatively affects however the cost of the machine.

[0013] A more cost-effective and simple method is de-

fined in claim 2, for which a shape coupling can be exploited between a reference element and the piece that obtains positioning by contact.

[0014] The coming together of the piece and the reference element can be obtained by moving only one of the two against the other, or both of them.

[0015] It is advantageous to operate as defined in claim 4, since for example a force applied on the piece along its longer side ensures that it is more stable and more precise in its positioning.

[0016] In order to obtain the method a positioning device can be manufactured according to claim 5: in which an abutment and/or mechanical lock is exploited between reference means and the piece. The coming together of the piece and the reference means is obtained by means for displacing the piece and/or by the reference element.

[0017] The advantages of the invention shall become clearer from the following description of a preferred embodiment of a device, with reference to the attached drawings, in which

Fig. 1 schematically shows a system for supplying pieces to a press brake,

Fig. 2 shows a plan view of a system for supplying pieces according to the invention,

Fig. 3 shows a side view of a loading plane of the system of fig. 2,

Fig. 4 shows a plan view of the loading plane of fig. 3.

[0018] In the system of fig. 2 the work stations reflect the general scheme of fig. 1. The pieces to be bent are loaded manually in a rough sorting station 30, then a manipulator 26 moves them on to a second station or centring and/or positioning device 60, and finally a robot 24 picks up the pieces and introduces them into a press 22.

[0019] The device 60 comprises (see also figs. 3 and 4) a plane or table 62 on which, guided linearly by side guides 66, a mobile transversal slider 64, for example a rod can slide. The slider 64 is actuated in a controlled manner by motor means, not shown, to move in two directions (arrow W). The slider 64 is equipped, at the bottom, with a brush or bristles or rigid or semi-rigid filaments 70 (or other material that can create friction) that are capable of sliding over the plane 62.

[0020] The plane 62, in plan view, has a recess 68 to promote the coming closer of the robot 24.

[0021] Fig 4 also shows a fixed plate RF on the plane 62 and, in the broken line, a flat piece L is shown as it arrives on the plane 62 deposited by the manipulator 26. The plate RF is countershaped with respect to the piece L.

[0022] During operation, the device 60 operates as follows. The slider 64 is taken above the recess 68, then the robot 26 arranges a piece L (in the broken line) in front of it. Then the slider 64 is actuated in the opposite direction so that the brush 70 drags, like a rake (arrow F), the piece L against the reference RF.

[0023] Once contact has occurred, thanks to the respective matching shapes, the piece L takes up, on the plane 62, a desired position/orientation defined by the reference RF. Now the robot 24 can pick up the piece L, which is precisely in a predefined position (for example in coordinates x,y). The cycle starts again by bringing the slider 64 back above the recess 68. The reference RF can be replaced or assisted by other types of references fixed on the plane 62. For example as reference means one or more pins or rods or shafts 74, fitted vertically into holes 72 obtained on the plane 62, can be used. The piece L rests on the pins 74, for example at the vertices of its section. The holes 72 can also be used as screwing points for the plate RF. It should be understood how easy it is to simply and quickly configure these reference means on the plane 62, since it is sufficient to change the position of the abutments.

[0024] In the case of non flat pieces L and/or pieces that project in depth, one or more templates located on the plane 62 can be used as reference means. For example, the templates can be a negative match of all or part of the shape of the piece, so as to house it and centre it precisely.

[0025] Optionally, even the pre-loading station 30 can be improved. On a rotary table 32, loading areas 34 are foreseen that end up in turn below the manipulator 26 making the table 32 rotate. These areas 34, or in general the surface of the table 32, can comprise one or more pins or shafts (not shown) fitted vertically into holes obtained on the bottom of the area 34 or of the table 32. The function of these pins or rods or shafts is analogous to that of the pins 74, with the same advantages in terms of ease of preparation of the machine and centring of the pieces. Moreover, the manual loading into the station 30 is facilitated, since the worker only needs to fit the pieces between the pins, usually according to a single possible way.

[0026] The table 32 can be replaced with a lane from which the manipulator 26, moving, takes the pieces from piles in rows.

Claims

1. Method for positioning a piece (L) on a loading area (60, 62) from which a loader (24) picks it up to bend it with a press brake (22), wherein the piece is moved from a position in which it arrives in the area to a position in which it has an orientation that is predefined in an obligatory manner.
2. Method according to claim 1, wherein the orientation of the piece is conditioned making the piece meet with a reference element (RF) that positions the piece through abutment and/or mechanical stop.
3. Method according to claim 2, wherein the piece is pushed against the reference element (RF) and/or

the reference element (RF) is pushed towards the piece.

4. Method according to claim 3, wherein the piece and the reference element (RF) are placed in contact along the larger side of the piece.
5. Device (60) for positioning a piece on a loading area (62) from which a loader (24) picks it up to bend it with a press brake (22), comprising
 - reference means (RF) that are suitable for positioning the piece through abutment and/or mechanical locking;
 - means (64, 70) for making the piece meet with the reference element.
6. Device according to claim 5, wherein the reference means (RF) comprise one or more pins (74) located in the loading area (62).
7. Device according to claim 5 or 6, wherein the loading area comprises a plane having a plurality of holes or seats (72) with/on which to fix the reference means (RF).
8. Device according to claim 5 or 6 or 7, wherein the reference means comprise one or more templates (RF) located in the loading area (62).
9. Device according to any one of claims 5 to 8, wherein the reference means comprise one or more shaped slabs (RF) arranged flat in the loading area (62).
10. Device according to any one of claims 5 to 9, wherein the meeting means comprise a mobile member (64) suitable for taking the piece towards the reference means (RF).
11. Device according to claim 10, wherein the mobile member (64) comprises one brush (70).
12. Device according to claim 10 or 11, wherein the mobile member (64) comprises a material that is capable of creating friction on the piece.
13. Device according to any one of claims 5 to 12, associated with a pre-loading station (30) from which the pieces placed in the loading area (62) arrive, the pre-loading station (30) comprising vertical references between which to stack pieces, the vertical references being arranged so as to trap the piece through mechanical interference.
14. Device according to claim 13, wherein the vertical references comprise pins or rods that can be fixed in holes (34) present on a surface of the pre-loading station (30).

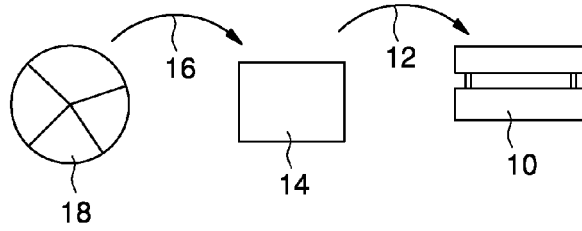


Fig. 1 (prior art)

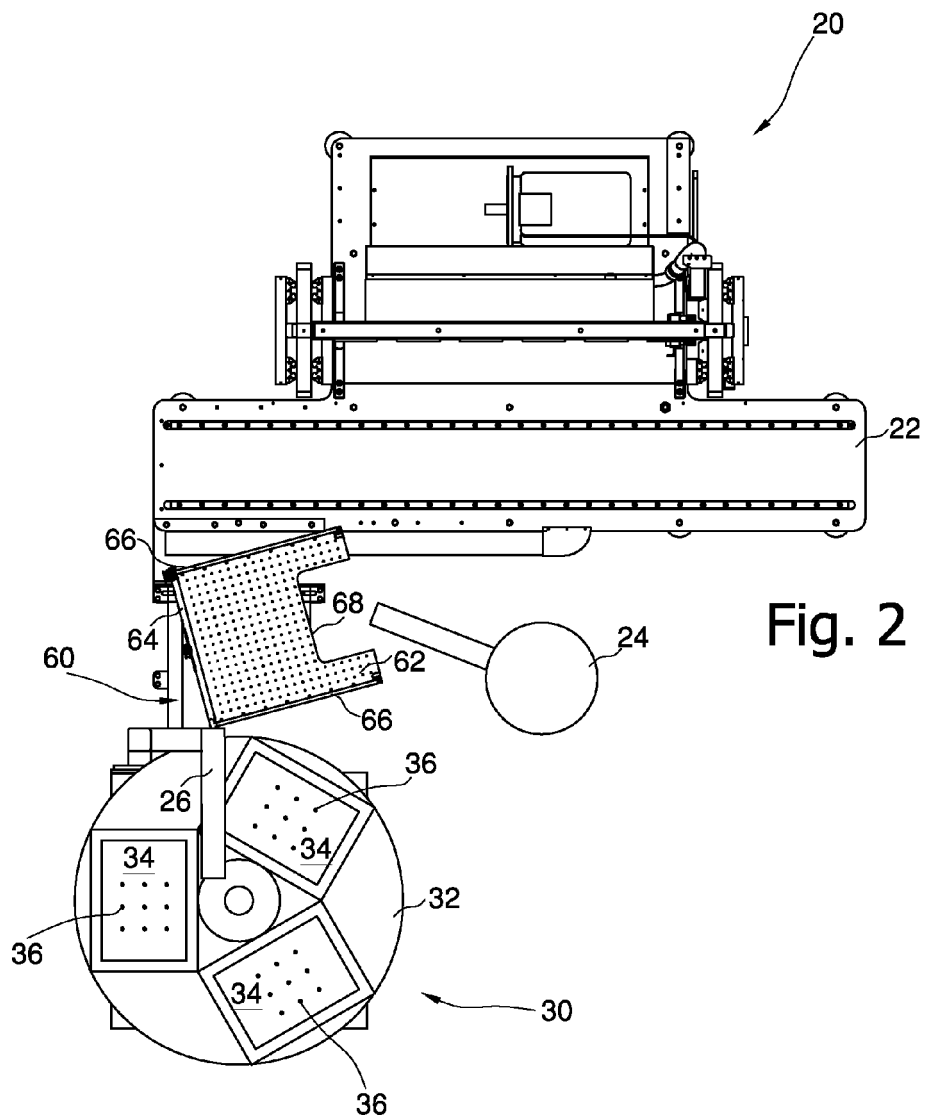


Fig. 2

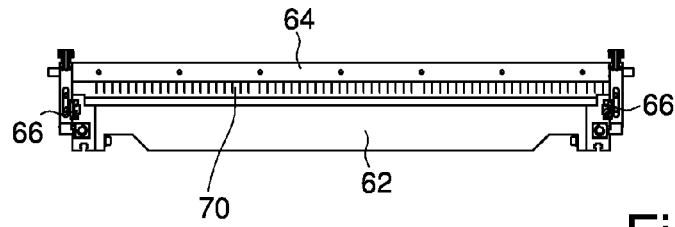


Fig. 3

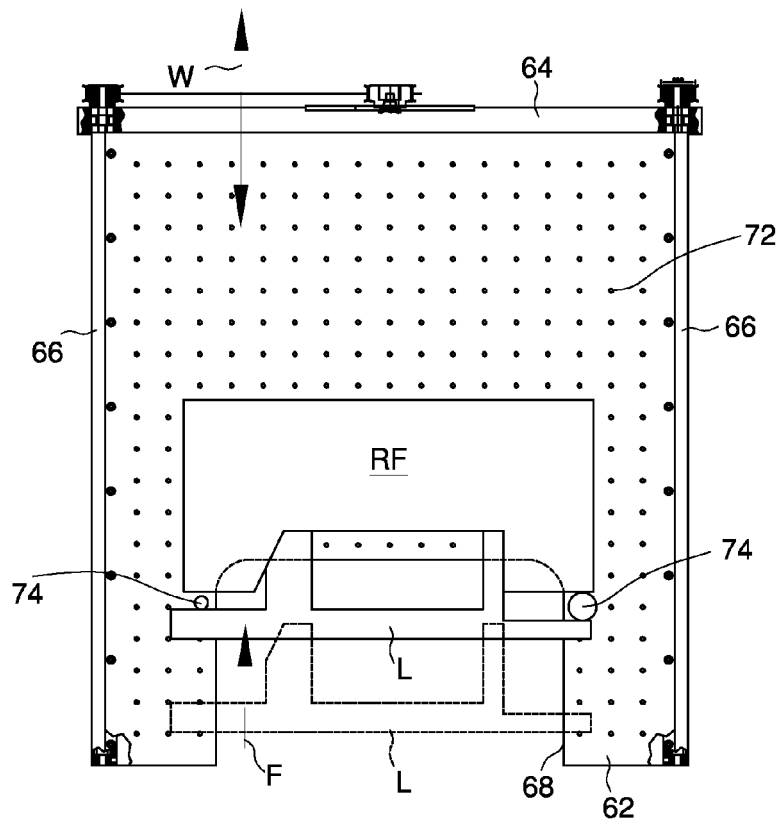


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 11 15 3120

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	DE 196 15 251 A1 (KB KNECHT GMBH [DE] KB KNECHT GMBH BETRIEBSEINRICHTUNG [DE]) 23 October 1997 (1997-10-23) * column 5, lines 51-58; figures *	1-14	INV. B21D5/02 B21D43/00 B21D43/26
X	JP 6 179023 A (TOYO KOHAN CO LTD) 28 June 1994 (1994-06-28) * abstract; figures *	1-14	
A	JP 57 199522 A (HITACHI LTD) 7 December 1982 (1982-12-07) * figure 10 *	1-14	
A	JP 11 244965 A (SANYU KOGYO KK) 14 September 1999 (1999-09-14) * abstract; figures *	1-14	
			TECHNICAL FIELDS SEARCHED (IPC)
			B21D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 6 September 2011	Examiner Knecht, Frank
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 11 15 3120

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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06-09-2011

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 19615251	A1	23-10-1997	NONE	
JP 6179023	A	28-06-1994	JP 2665866 B2	22-10-1997
JP 57199522	A	07-12-1982	NONE	
JP 11244965	A	14-09-1999	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- GB 784981 A [0002]
- EP 0476092 A [0002]