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(54) **DEVICE FOR SUPPORTING A METAL SHEET DURING BENDING IN A PRESS BRAKE**

(57) The invention relates to a device for supporting a metal sheet during bending in a press brake, which device comprises:

- a base;
- a support for supporting a metal sheet;
- a rod system arranged between the base and the support for rotating the support around a rotation axis relative to the base, wherein the rod system has a first and second rod substantially parallel to each other and rotatably arranged to the base and a connecting third rod rotatably arranged to the free ends of the first and second rods, such that the base, the first, second and third rods form

a substantially parallelogram shaped rod system; and
- driving means arranged between the base and one of the first, second or third rods;
wherein the driving means comprise:
- a drivable spool;
- one or more rollers;
- a belt mount; and
- a belt mounted with one end to the belt mount and with the other end to the drivable spool;
wherein the belt runs along a serpentine path between the driveable spool, the one or more rollers and the belt mount.

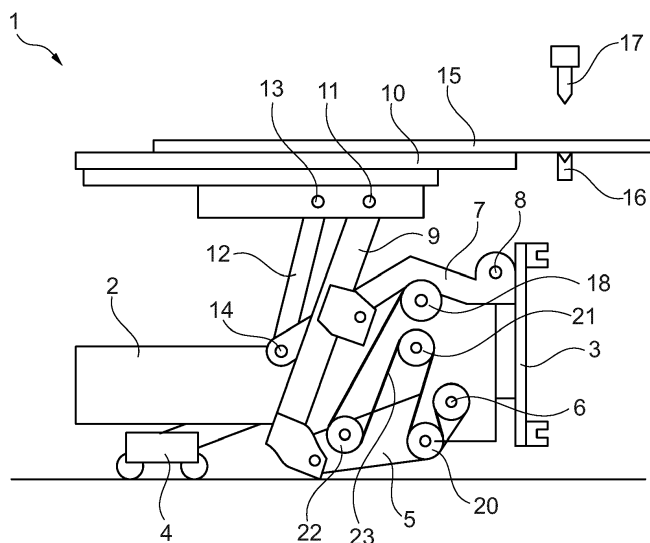


Fig. 1

Description

[0001] The invention relates to a device for supporting a metal sheet during bending in a press brake, which device comprises:

- a base;
- a support for supporting a metal sheet;
- a rod system arranged between the base and the support for rotating the support around a rotation axis relative to the base, wherein the rod system has a first and second rod substantially parallel to each other and rotatably arranged to the base and a connecting third rod rotatably arranged to the free ends of the first and second rods, such that the base, the first, second and third rods form a substantially parallelogram shaped rod system; and
- driving means arranged between the base and at least one of the first, second or third rods.

[0002] Such a device is known from WO 2015139066.

[0003] When bending metal sheet in press brakes, the free ends of the metal sheet will tend to move up, when the press brake tools are brought together. Especially with large sheets, it is desired to support the free ends of the metal sheet to avoid any additional bending of the free ends. Also supporting the free ends of the metal sheet during bending ensures that the intended bend in the metal sheet is more accurate, than without support.

[0004] The device according to WO 2015139066 provides a support for supporting a metal sheet, which rotates around a rotation axis, which can coincide with the tools in a press brake, such that the support follows the same path as free ends of the metal sheet.

[0005] The device of WO 2015139066 is driven by an electric motor, driving a gear box, which coupled via lever and a connecting rod to the rod system of the device. All these parts introduce play into the driving means, which prevent accurate and precise manipulation of the free ends of the metal sheet during bending. The play can be reduced by costly solutions, which would make the device financially unattractive.

[0006] It is an object of the invention to reduce the above mentioned disadvantages according to the prior art.

[0007] This object is achieved with a device according to the preamble, which is characterized in that the driving means comprise:

- a drivable spool;
- one or more rollers;
- a belt mount; and
- a belt mounted with one end to the belt mount and with the other end to the drivable spool;

wherein the belt runs along a serpentine path between the driveable spool, the one or more rollers and the belt mount.

[0008] The use of a driven belt and one or more rollers provides a cost effective solution for the driving means. Furthermore, the small number of components in the driving means also reduce the play and requires minimal maintenance.

[0009] An additional advantage of the invention, is that the driven belt with rollers allows for compact driving means and easy integration with the rod system, while the known driving means with gear box, lever and connecting means, typically require additional space outside.

[0010] In a preferred embodiment of the device according to the invention the sequence of parts being the drivable spool, the one or more rollers and the belt mount are alternately arranged on the base and the one of the first, second or third rods.

[0011] This means that for example, the drivable spool is arranged to the base, one roller is arranged to the first rod, a second roller is again arranged to the base and the belt mount is arranged to the first rod. Then by having the belt running along a serpentine path between the driveable spool along the first and second roller to the drive mount, the rod system can be moved simply by winding up the belt or winding off the belt.

[0012] Preferably, the drivable spool is driven by an electric motor. An electric motor can easily be controlled by the controller of the press brake, such that the movement of the support is synchronized with the movement of the tools of the press brake and accordingly the bending of the metal sheet.

[0013] In another preferred embodiment of the device according to the invention, the support for supporting a metal sheet is rotatably arranged to the connecting third rod, wherein a fourth connecting rod is arranged with one end rotatably to the support and with the other end rotatably to the first or second rod and wherein the fourth connecting rod extends substantially parallel to the third connecting rod.

[0014] The fourth connecting rod together with the support, the connecting third rod and one of the first and second rod, provide a second parallelogram rod system, which moves synchronously with the main parallelogram rod system. This allows for support to be arranged at a distance from the rod system of the device and allows for better adaptation in height and distance to for example a press brake.

[0015] Preferably, the support for supporting a metal sheet is substantially parallel to the first and second rod. This will ensure that the weight of the support and the supported metal sheet urge the first and second parallel rods together due to gravity. The driving means can then pull the first and second rod away from each other, operating the rod system and lifting and rotating the support with the metal sheet around the rotation axis.

[0016] Preferably, the driving means are arranged between the base and the first rod.

[0017] These and other features of the invention will be elucidated in conjunction with the accompanying

drawings.

Figure 1 shows a side view of an embodiment of the device according to the invention with the support in a horizontal position.

Figure 2 shows the embodiment of figure 1 with the support in a tilted position.

[0018] Figure 1 shows an embodiment of a device 1 according to the invention. The device 1 has a base 2 with a press brake mount 3 and height adjustable support wheels 4. The press brake mount 3 allows for mounting the device 1 to a press brake and the height adjustable support wheels 4 allow for the base 2 to be additionally supported under heavy conditions..

[0019] A first rod 5 is rotatably arranged around axle 6 to the base 2. A second rod 7 is also rotatably arranged around axle 8 to the base 2. A connecting third rod 9 keeps the first rod 5 and second rod 7 substantially parallel, while forming a parallelogram rod system.

[0020] A support 10 is rotatably connected to an end of the connecting rod 9 via the axle 11. A fourth connecting rod 12 connected rotatably with one end via axle 13 to the support 10 and with the other end via axle 14 to the second rod 7 ensures that the angle between the support 10 and the first rod 5 and the second rod 7 is constant during movement, preferably moves substantially parallel.

[0021] The support 10 supports a metal sheet 15, which extends between a lower tool 16 and an upper tool 17 of a press brake.

[0022] To drive the rod system 2, 5, 7, 9, 10, 12 a driveable spool 18 is arranged to the base 2. Furthermore a belt mount 19 is arranged to the base 2, and first roller 20, second roller 21 and third roller 33 are alternately arranged to the first rod 5 and the base 2. A belt 23 is attached with one end to the belt mount 19 and with the other end to the driveable spool 18, while running along a serpentine path between the rollers 20, 21, 22.

[0023] When the lower tool 16 and upper tool 17 of the press brake are brought together to bent the metal sheet 15, the driveable spool 18 will be driven to wind up the belt 23. As a result the rod system 2, 5, 7, 9, 10, 12 will start to move bringing the support 10 upward and rotating around a rotation axis 24 positioned at the lower tool 16, such that the metal sheet 15 is fully supported during the bending by the press brake and the tools 16, 17.

Claims

1. Device for supporting a metal sheet during bending in a press brake, which device comprises:

- a base;
- a support for supporting a metal sheet;
- a rod system arranged between the base and the support for rotating the support around a ro-

tation axis relative to the base, wherein the rod system has a first and second rod substantially parallel to each other and rotatably arranged to the base and a connecting third rod rotatably arranged to the free ends of the first and second rods, such that the base, the first, second and third rods form a substantially parallelogram shaped rod system; and

- driving means arranged between the base and one of the first, second or third rods;

characterized in that

the driving means comprise:

- a drivable spool;
- one or more rollers;
- a belt mount; and
- a belt mounted with one end to the belt mount and with the other end to the drivable spool;

wherein the belt runs along a serpentine path between the driveable spool, the one or more rollers and the belt mount.

2. Device according to claim 1, wherein the sequence of parts being the drivable spool, the one or more rollers and the belt mount are alternately arranged on the base and the one of the first, second or third rods.
3. Device according to claim 2, wherein the drivable spool is driven by an electric motor.
4. Device according to any of the preceding claims, wherein the support for supporting a metal sheet is rotatably arranged to the connecting third rod, wherein a fourth connecting rod is arranged with one end rotatably to the support and with the other end rotatably to the first or second rod and wherein the fourth connecting rod extends substantially parallel to the third connecting rod.
5. Device according to any of the preceding claims, wherein the support for supporting a metal sheet is substantially parallel to the first and second rod.
6. Device according to claim 5, wherein the driving means are arranged between the base and the first rod.

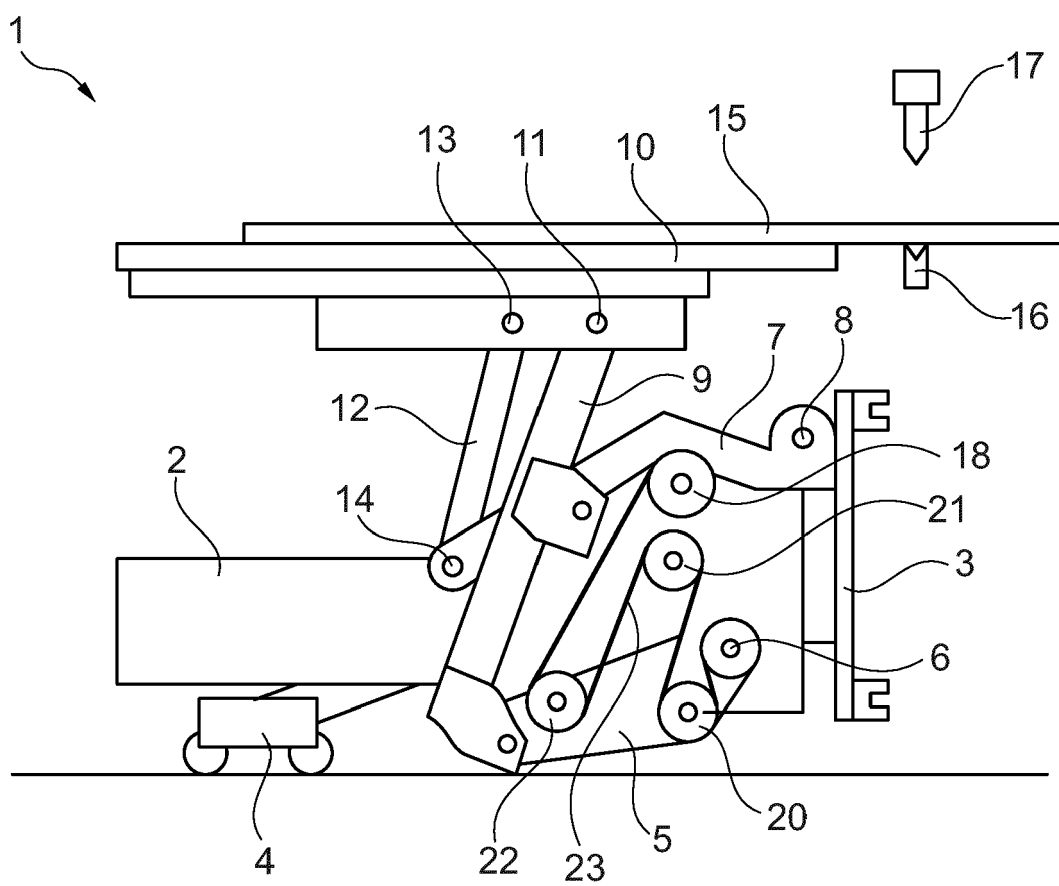


Fig. 1

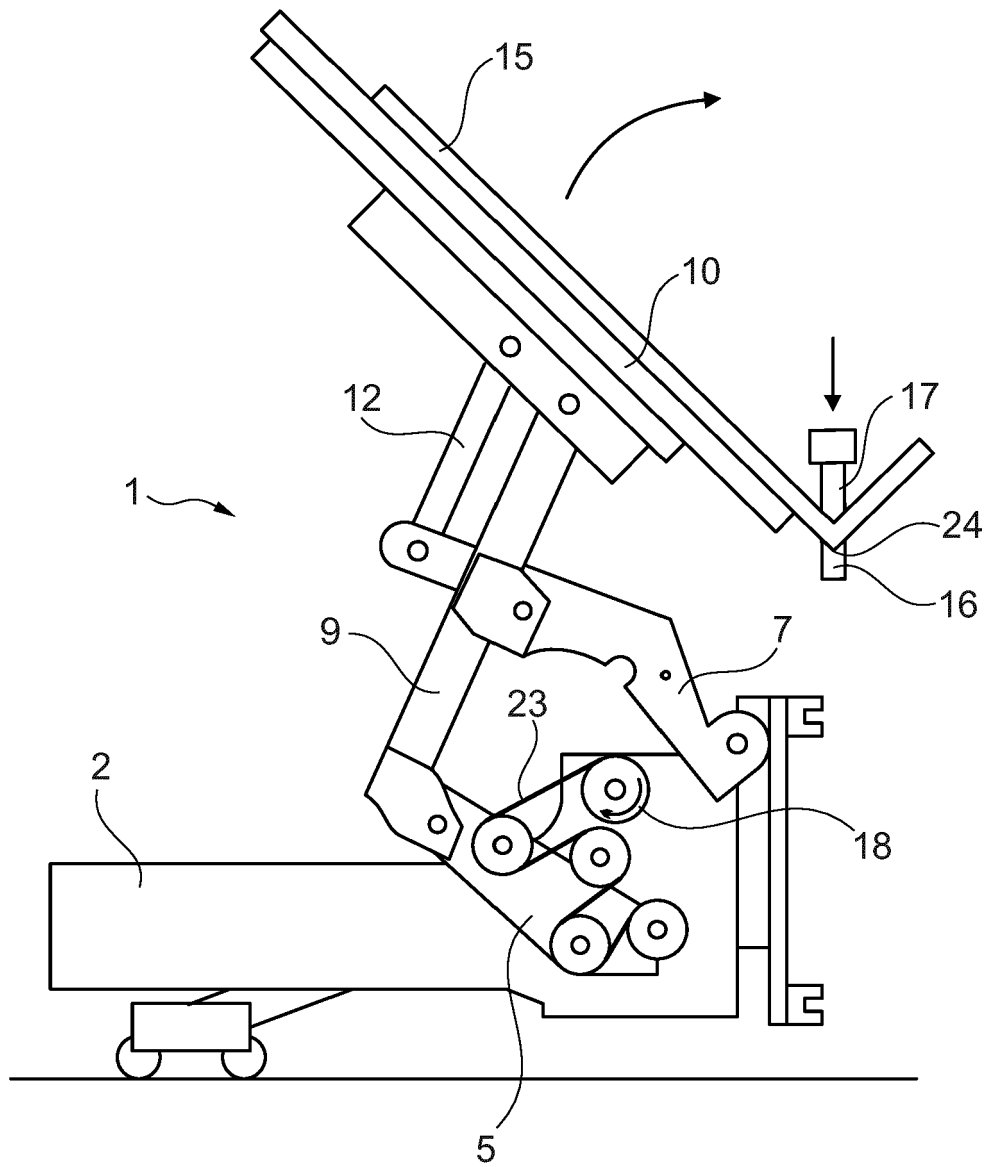


Fig. 2



EUROPEAN SEARCH REPORT

Application Number
EP 19 17 4714

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 September 2019	Examiner Stanic, Franjo
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 19 17 4714

5 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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