(19) Europäisches Patentamt
European Patent Office
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(11) **EP 2 722 163 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
23.04.2014 Bulletin 2014/17

(51) Int Cl.:
B30B 1/00 *(2006.01)* ***B30B 1/30*** *(2006.01)*
B30B 15/04 *(2006.01)*

(21) Application number: **12189146.9**

(22) Date of filing: **18.10.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(54) **Driving unit with integrated driving means**

(57) The invention relates to a driving unit for driving two substantially parallel beams (2,6) away or towards each other, comprising:
- a first beam (6) of the substantially parallel beams and a second beam (2);
- and driving means at least arranged between the first beam (6) and the second beam (2);
wherein the driving means are substantially arranged inside the first beam (6).

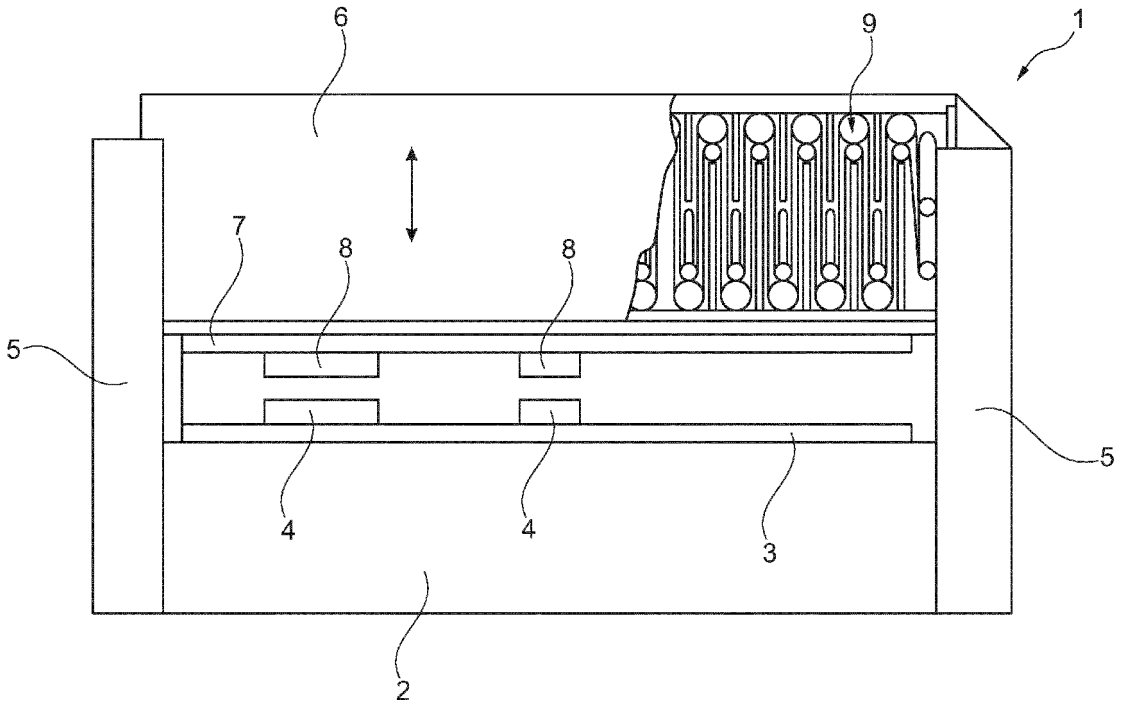

Fig. 1

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Description

[0001] The invention relates to a driving unit for driving two substantially parallel beams away or towards each other, comprising:

- a first beam of the substantially parallel beams and a second beam;
- and driving means at least arranged between the first beam and the second beam.

[0002] Such a driving unit can be used for driving for example a press brake, another press or a shear.

[0003] Two main types of press brakes are known in the prior art: hydraulic driven press brakes and electric driven press brakes.

[0004] A typical hydraulic driven press brake has a stationary lower beam, two hydraulic cylinders arranged on either side of the lower beam and a movable upper beam driven by the hydraulic cylinders. Press brake tools can be seated in the lower beam and upper beam, such that a sheet metal plate can be bent into a desired angle by moving the upper beam and lower beam towards each other.

[0005] A typical electric driven press brake also has a stationary lower beam and a movable upper beam. Furthermore, a frame is provided, of which at least a frame section runs parallel and on both sides of the movable upper beam. Rows of rollers are arranged on both parts of the frame section and on both sides of the movable upper beam. Belts run in a serpentine path between the rollers. By providing a pull force on the belts, the upper beam is urged towards the lower beam. Such a press brake is for example disclosed in EP 0384529.

[0006] When bending a sheet metal plate on a press brake, the maximum bending angle is defined by the width of the upper beam. With an electric driven upper beam, the maximum bending angle is smaller than with a hydraulic driven press brake. This is caused by the extra width of the frame section provided with the rollers.

[0007] Because part of the rollers are arranged on the movable beam, these rollers will move towards the lower beam, such that the width of the rollers and the upper beam will be more of influence on the maximum bending angle.

[0008] It is an object of the invention to reduce the above mentioned disadvantages.

[0009] This object is achieved with a driving unit according to the preamble, which driving unit is **characterized in that** the driving means are substantially arranged inside the first beam.

[0010] By arranging the driving means inside of the first beam, which will be typically, in case of a press brake or shear, the upper beam, the width of the driving unit and in case of a press brake the width of the upper beam is reduced, such that the maximum bending angle is increased. Also with the invention, the width of the upper beam is only defined by the upper beam itself and the width is no longer increased by rollers arranged on the outside of the upper beam.

[0011] In an embodiment of the driving unit according to the invention the first beam comprises a front plate, a back plate spaced apart from the front plate and a plurality of strips arranged between the front plate and the back plate, like the web of an I-beam.

[0012] In this embodiment, the upper beam has a sandwich construction, providing a rigid beam, while leaving room inside the beam for driving means.

[0013] In a preferred embodiment of the driving unit according to the invention the driving means comprise a first row of rollers arranged to the first beam, a second row of rollers arranged to the frame, a belt running along the rollers in a serpentine path, and a take up reel for taking up the belt in order to urge the first row of rollers towards the second row of rollers.

[0014] Preferably the axles of the second row of rollers extend through at least one opening in the first beam and which axles are arranged with an end to the frame.

[0015] In a further embodiment of the driving unit according to the invention, the strips are arranged between and in near contact with adjacent rollers of a row.

[0016] By arranging the strips in near contact with adjacent rollers, it is prevented that the belt runs off the rollers when the press brake tilts or gets stuck in the guides. This could typically occur, when the first beam is moved away from the other beam. This movement is for example caused by springs urging the beams away from each other and by simultaneously releasing additional length of belt. When the movement of the first beam is delayed or gets stuck, the releasing of the length of belt will continue. As a result, the belt could run off rollers. However, by arranging the strips in near contact with the rollers, this is prevented.

[0017] The invention further relates to a press brake comprising a frame and a driving unit according to the invention, wherein the frame is arranged to the second beam, such that the driving means are at least arranged between the first beam and the frame.

[0018] By arranging the driving means inside of the first beam, which will be typically the upper beam, the width of the upper beam is reduced, such that the maximum bending angle is increased. Also with the invention, the width of the upper beam is only defined by the upper beam itself and the width is no longer increased by rollers arranged on the outside of the upper beam.

[0019] In an embodiment of the press brake according to the invention the frame extends parallel to the first beam and the driving means inside the first beam are arranged to the frame via at least an opening in the first beam.

[0020] When the first beam moves towards the other beam, the frame section extending parallel to the first beam will be stationary. So, this frame section will be at a distance from the zone, where the sheet metal is bent. As a result, the width of the frame section will be of less or even no influence on the maximum bending angle. An

additional advantage is that the stiffness of the frame section can easily be increased without having a substantial effect on the maximum bending angle.

[0021] A preferred embodiment of the press brake according to the invention, comprises at least two parallel guides arranged to the frame and on opposite ends of the first beam for guiding the first beam relative to the frame.

[0022] The guides ensure that the first beam moves in a defined path and that the stability of the press brake is ensured, in particular when large pressure is exerted onto a workpiece.

[0023] These and other features of the invention, will be elucidated in conjunction with the accompanying drawing.

Figure 1 shows a frontal view of an embodiment of a press brake according to the invention.
Figure 2 shows a perspective view of the movable upper beam of figure 1.
Figures 3A and 3B show a cross sectional view of the upper beam of figure 2 in two positions.
Figure 1 shows a press brake 1 according to the invention. The press brake 1 has a stationary lower beam 2 with a tool holder 3 having two lower tools 4.

[0024] In the drawings a driving unit according to the invention is explained in conjunction with a press brake according to the invention. The driving unit of the invention can also be used for driving two beams in other devices such as a shear or another type of press.

[0025] Frame parts 5 with integrated guides are arranged on both sides of the lower beam 2. The guides of the frame parts 5 guide a movable upper beam 6. This upper beam 6 also comprises a tool holder 7 and upper tools 8, which cooperate with the lower tools 4.

[0026] The upper beam 6 is hollow and houses the driving means 9 as will be further explained in combination with figures 2 and 3.

[0027] As shown in figure 2, the upper beam 6 has an inner frame 10 with a front plate 11 and a back plate 12. Guide blocks 13 are arranged on the outer end of the frame 10. Furthermore, strips 14, 15 are placed between the front plate 11 and the back plate 12 to further strengthen the upper beam 6.

[0028] Inside the hollow upper beam 6 driving means are arranged, which comprise a double row of primary rollers 16 and a double row of secondary rollers 17. A belt 18 serpentines between the primary rollers 16 and the secondary rollers 17. The free ends of the belt 18 are wound on take up reels 19, 20. Such a drive means 9 is for example known from EP 2143553.

[0029] Figures 3A and 3B show a cross sectional view of the upper beam 6. It is clearly shown that the driving means comprising the rollers 16, 17 and belt 18 are arranged inside the upper beam 6, between the front plate 11 and back plate 12.

[0030] The axles 22 of the primary rollers 16 are arranged to the front plate 11 and back plate 12 of the upper beam 6, while the axles 23 of the secondary rollers 17 are arranged to a parallel frame section 21.

[0031] Now when the take up reels 19, 20 take up a length of belt 18, the primary rollers 16 will be pulled towards the secondary rollers 17, such that the upper beam 6 will move downward and the upper tools 8 are brought towards the lower tools 4.

[0032] It is furthermore clear from figure 2, that the rollers 16, 17 are arranged in near contact with each other, with the strips 14, 15 and with front plate 11 and back plate 12. This prevents the belt 18 from slipping off the rollers 16, 17.

Claims

1. Driving unit for driving two substantially parallel beams away or towards each other, comprising:

   - a first beam of the substantially parallel beams and a second beam;
   - and driving means at least arranged between the first beam and the second beam;
   characterized in that
   - the driving means are substantially arranged inside the first beam.

2. Driving unit according to claim 1, wherein the first beam comprises a front plate, a back plate spaced apart from the front plate and a plurality of strips arranged between the front plate and the back plate, like the web of an I-beam.

3. Driving unit according to claim 1 or 2, wherein the driving means comprise a first row of rollers arranged to the first beam, a second row of rollers arranged to the frame, a belt running along the rollers in a serpentine path, and a take up reel for taking up the belt in order to urge the first row of rollers towards the second row of rollers.

4. Driving unit according to claim 3, wherein the axles of the second row of rollers extend through at least one opening in the first beam and which axles are arranged with an end to the frame.

5. Driving unit according to claim 1 and 2 or 3, wherein the strips are arranged between and in near contact with adjacent rollers of a row.

6. Press brake comprising:

   - a frame; and
   - a driving unit according to any of the preceding claims, wherein the frame is arranged to the second beam, such that the driving means are at least arranged between the first beam and the

frame.

7. Press brake according to claim 6, wherein the frame extends parallel to the first beam and wherein the driving means inside the first beam are arranged to the frame via at least an opening in the first beam.

8. Press brake according to claim 6 or 7, comprising at least two parallel guides arranged to the frame and on opposite ends of the first beam for guiding the first beam relative to the frame.

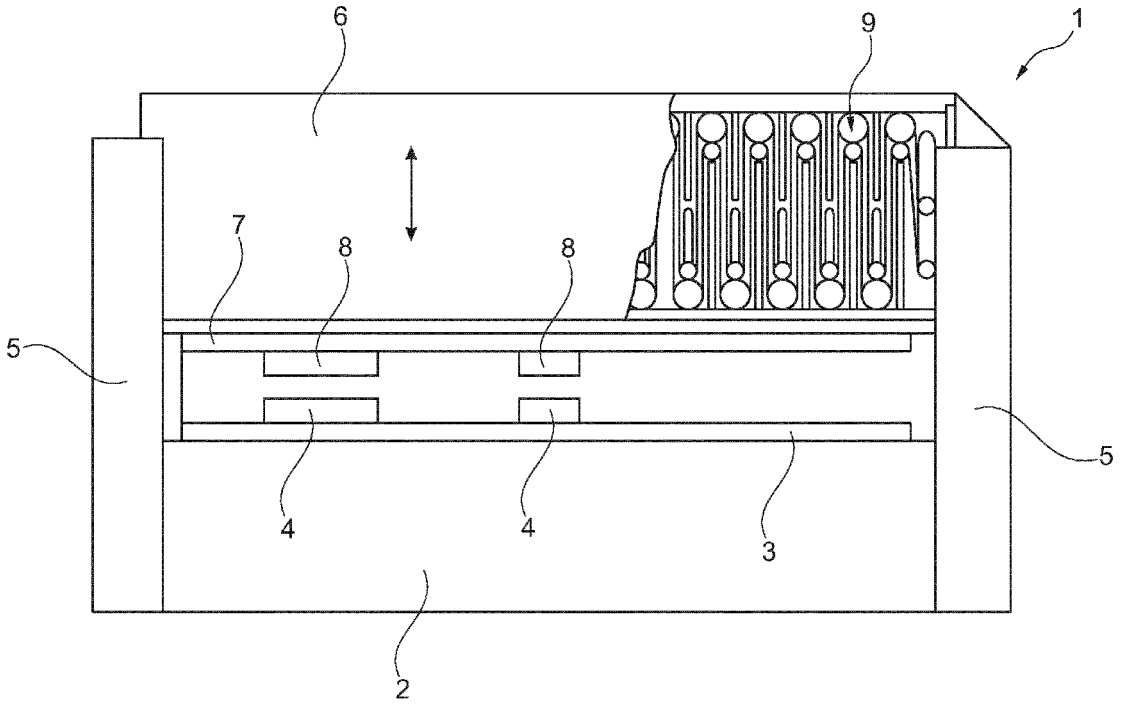

Fig. 1

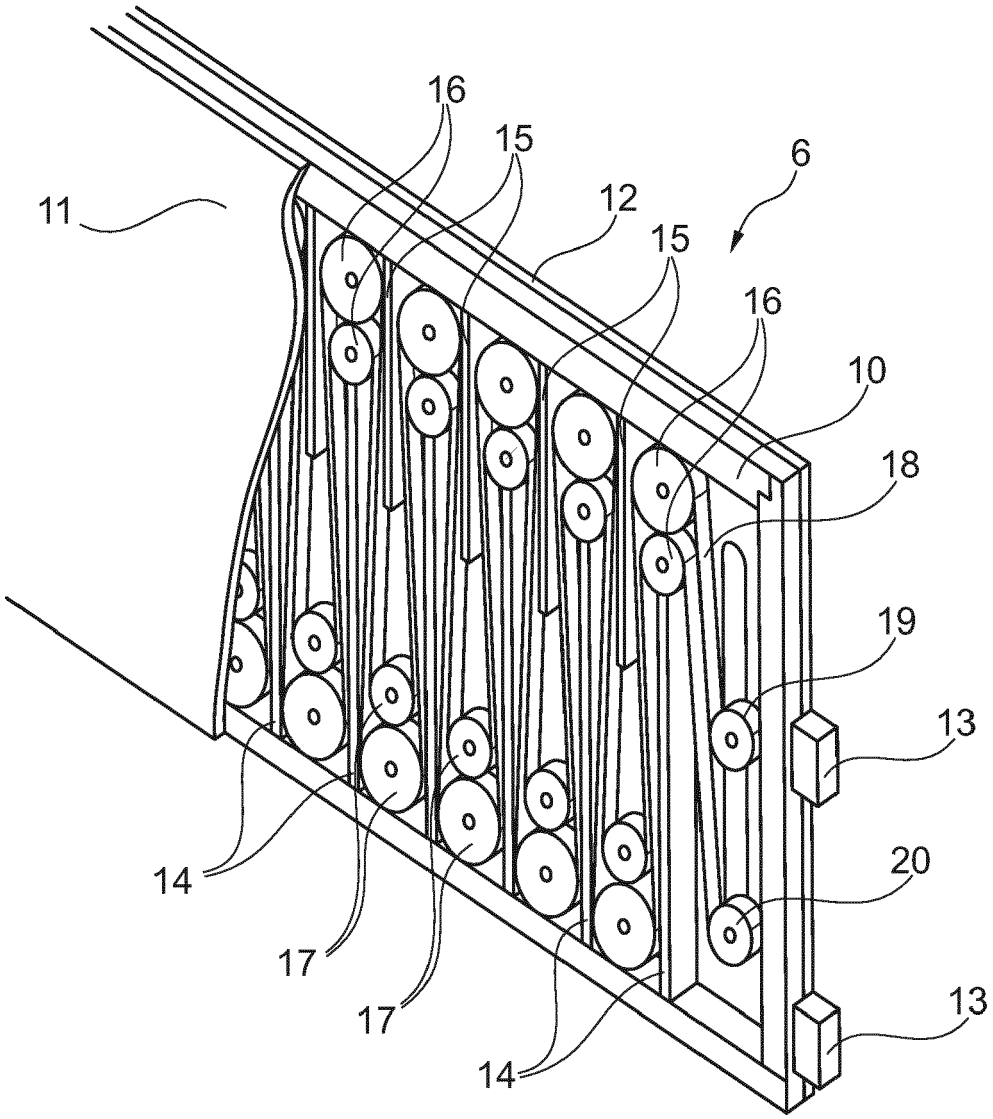

Fig. 2

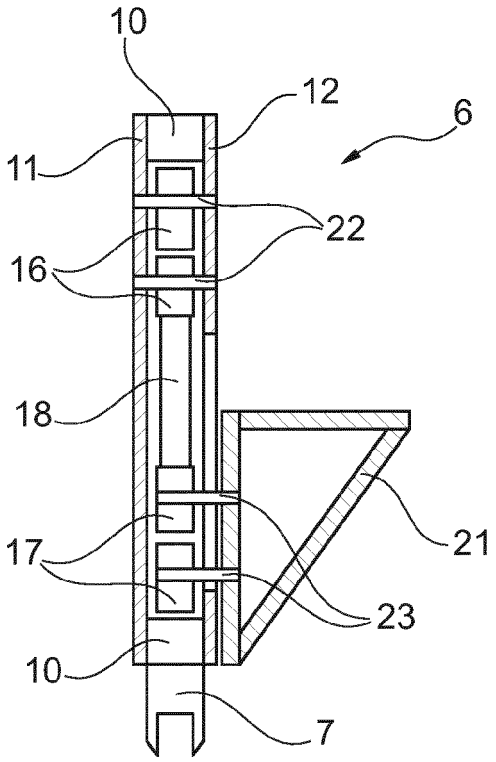

Fig. 3A

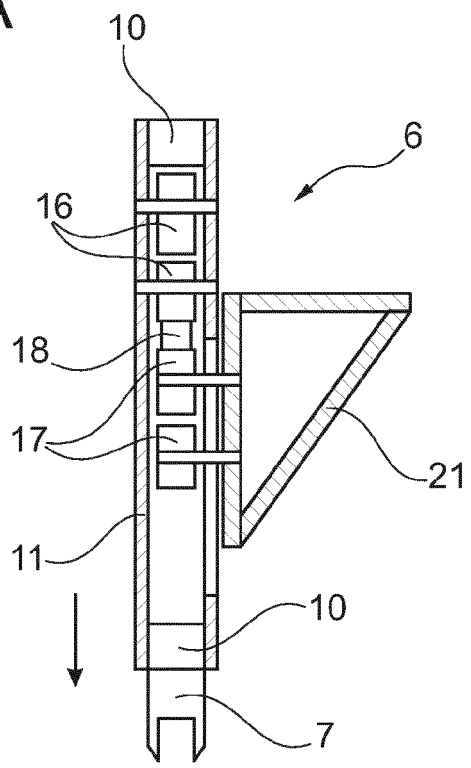

Fig. 3B

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EUROPEAN SEARCH REPORT

Application Number
EP 12 18 9146

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 January 2013	Bélibel, Chérif

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X : particularly relevant if taken alone
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