# United States Patent

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[54] **PRESS BRAKE**
**4 Claims, 6 Drawing Figs.**


[52] **U.S. Cl.** ..... **72/389,** 72/448, 72/450
[51] **Int. Cl.** ..... **B21d 5/01**
[50] **Field of Search** ..... 72/389, 386, 385, 380, 450, 448



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**ABSTRACT:** The disclosure relates to a press brake comprising a frame, a bed mounted on the frame and a ram adapted to move towards the bed. Mechanical linkages are provided one at each end of the ram for interconnecting the ram to the frame of the press brake. Such mechanical linkages are operated simultaneously to ensure parallel movement of the ram towards the bed regardless of uneven loading of the press. In a preferred embodiment of the invention, each mechanical linkage comprises a lever member pivotally mounted on the frame of the press brake and having one end thereof connected to the ram by means of two links located one on each side of the ram. The other end of the two lever members are interconnected by means of a suitable bar and such bar is operated by a single operating device. In addition, an adjusting wedge is provided adjacent each end of the bed for tilting the bed.

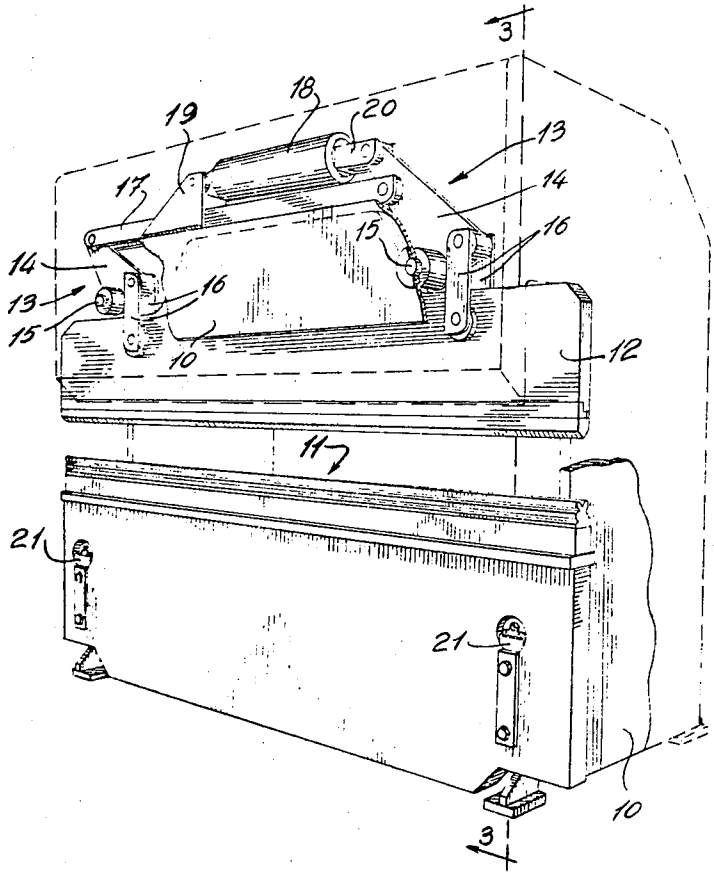
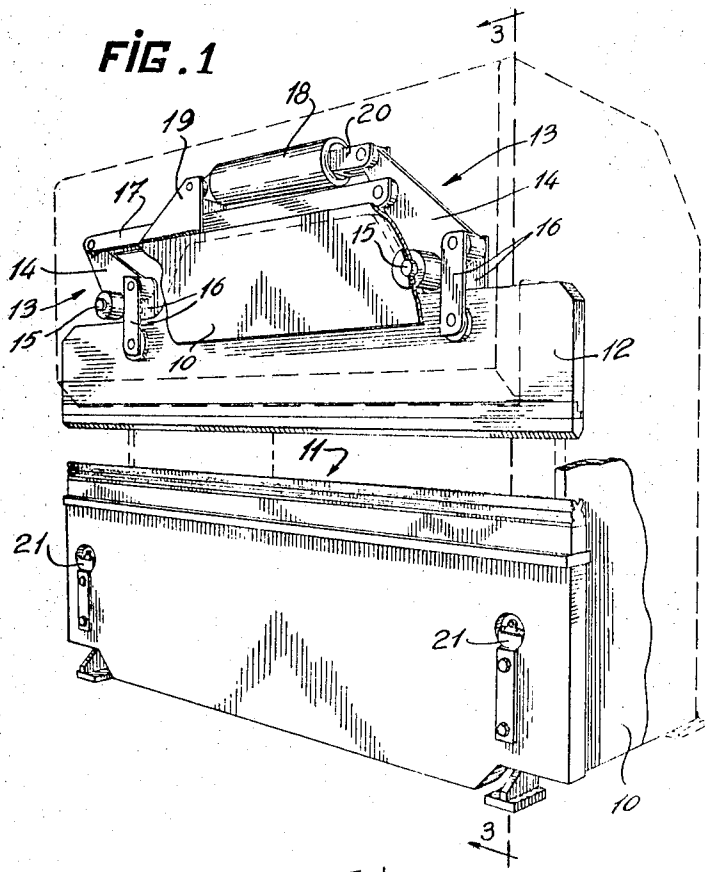



FIG. 1



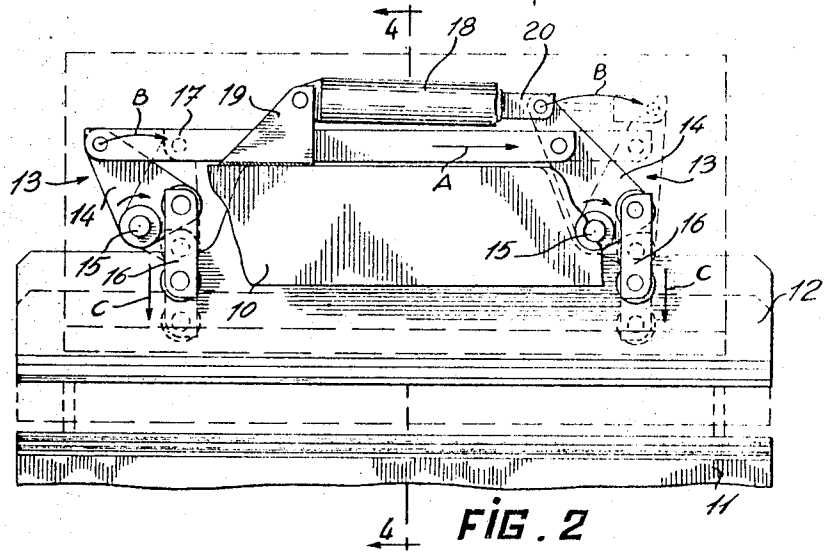




FIG. 2

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FIG. 3

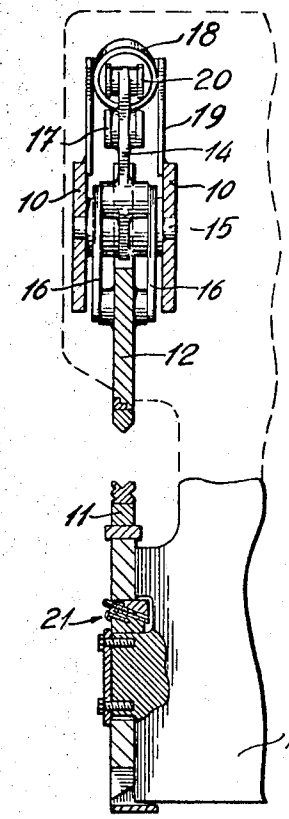
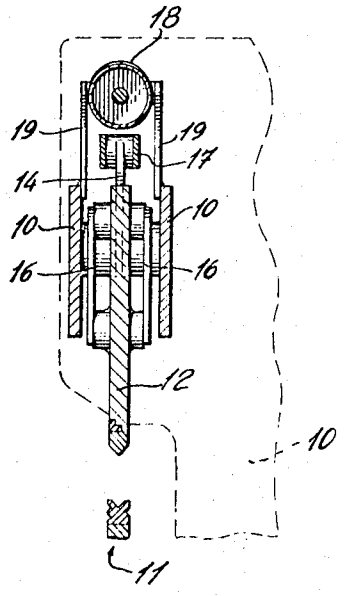



FIG. 4



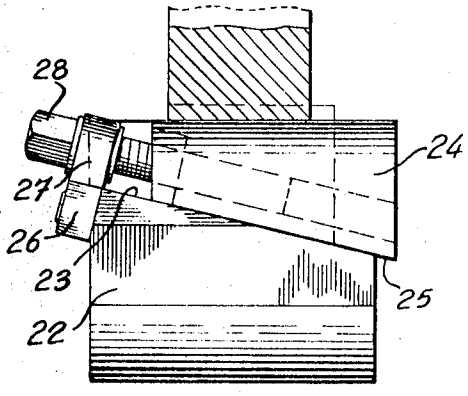




FIG. 5

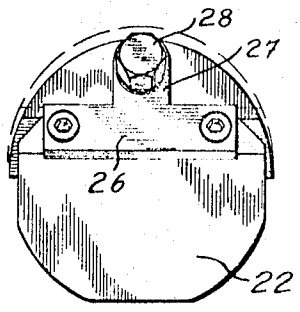



FIG. 6

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# PRESS BRAKE

This invention relates to a press brake used in cold forming of sheet metal.

Press brakes are commonly used in the industry for bending sheet metal of various width. They generally comprise a bed for receiving the sheet metal and a ram which is moved towards the bed for cold forming the sheet metal positioned on the bed. With such machines, it is very important that the movement of the ram be kept parallel to the bed. The systems used in the prior art for moving the ram of the press brakes towards the bed usually includes two hydraulic cylinders positioned one at each end of the ram and interconnected by complicated balancing systems for ensuring the parallel movement of the ram with respect to the bed. Such systems, however, are complicated and costly and furthermore do not ensure a precise parallel movement of the ram. Furthermore, it is also known to provide press brakes with suitable adjustment screws which permit tilting of the ram when it is required to do special fadeout works. However, such threaded adjusting devices are not always satisfactory as they often jam or deform.

It is therefore the main feature of the invention to provide a press brake which ensures an absolutely precise parallel movement of the ram with respect to the bed.

It is also a feature of the invention to provide tilt adjustment of the bed of the press brake instead of the ram thereof to avoid possible jam and to ensure that the ram and ram guides remain perfectly aligned.

The press brake, in accordance with the invention, comprises a frame, a bed mounted on the frame and a ram adapted to move towards the bed. Mechanical linkages are provided one at each end of the ram for interconnecting the ram to the frame of the press brake. Such mechanical linkages are operated simultaneously to ensure parallel movement of the ram towards the bed regardless of uneven loading of the press.

In a preferred embodiment of the invention, the mechanical linkages at each end of the ram comprise a lever member pivotally mounted on the frame of the press brake and having one end thereof connected to the ram by means of two links located one on each side of the ram. The other end of the two lever members are interconnected by means of a suitable bar and such bar is operated by a single operating device which may be, for example, a hydraulic cylinder.

Tilting adjustment of the press brake for accomplishing fadeout works is provided, in accordance with the invention by adjusting wedges allowing tilting of the bed. Unlike conventional press brakes, the ram is not tilted and, consequently, the ram and ram guides remain always perfectly aligned.

The invention will now be disclosed with reference to the accompanying drawings which illustrate a preferred embodiment of the invention and are not to be taken in a limiting way.

In the drawings:

FIG. 1 is a perspective view illustrating a press brake in accordance with the invention;

FIG. 2 is a front view of the press brake illustrating more clearly the mechanical linkages for operating the ram;

FIG. 3 is a section view of the press brake taken along lines 3–3 of FIG. 1;

FIG. 4 is a section view of the press brake taken along line 4–4 of FIG. 2;

FIG. 5 illustrates the adjusting wedges for tilting the bed; and

FIG. 6 is a front view of the wedge illustrated in FIG. 5.

Referring to FIGS. 1 and 2, there is shown a press brake comprising a frame 10 to which is secured a bed 11 and upon which is mounted a ram 12 adapted to move towards bed 11. As commonly known in the art, cold forming of sheet metal is effected by positioning the sheet metal between bed 11 and ram 12 and by lowering the ram 12 on the sheet metal.

As mentioned previously, it is necessary to ensure a precise parallel movement of the ram with respect to the bed in order to effect uniform bending of the sheet metal. In order to ensure parallel movement of the ram, there is provided, in accordance with a preferred embodiment of the invention, two mechanical linkages indicated generally by numeral 13, one at each end of ram 12. Mechanical linkage 13 comprises a lever member 14 pivotally connected by means of pivot 15 to frame 10. One end of lever member 14 is connected to ram 12 by means of links 16. The other end of the two lever members 14 are interconnected by a bar 17. In order to ensure parallel movement of the ram, it is necessary that the two lever members 14 be identical at least as far as the angles and distances from pivot !5 to the above-mentioned connections to links 16 and bar 17 are concerned. Furthermore, the distance between the pivoting points of bar 17 on lever members 14 must be equal to the distance between the two pivots 15.

Bar 17 is operated by a single operating device such as hydraulic cylinder 18 secured to plates 19 which are in turn welded to frame 10. A piston 20 is movable within cylinder 17 by conventional hydraulic connections not shown. Piston 20 is connected to one of lever members 14 in the embodiment shown. However, it is to be understood that piston 20 may be connected directly to bar 17.

It is also to be understood that other operating devices such as pneumatic cylinders, for example, could be used to activate bar 17.

FIGS. 3 and 4 are section views of FIGS. 1 and 2 illustrating the above-mentioned elements 10 to 20 from another angle which perhaps will help in understanding the invention. In addition, FIG. 3 illustrates generally the adjusting wedge 21 which permits the tilting adjustment of the bed 11.

FIGS. 5 and 6 illustrate in detail the adjusting wedge designated generally by reference numeral 21 in FIG. 3. Each wedge comprises a first wedge member 22 having an inclined surface 23 and a second wedge member 24 having an inclined surface 25 mating with inclined surface 23. A bracket 26 is secured to wedge member 22 and has a lug 27 integral therewith for receiving a bolt 28 which is threaded into wedge member 24. The tightening of bolt 28 causes the wedge member 24 to slide on wedge member 22 to tilt bed 11. There is one adjusting wedge at each end of the press brake to tilt each end of the bed 11.

The operation of the press brake, in accordance with the invention, may be more clearly understood with reference to FIG. 2 of the drawings. Movement of bar 17 by hydraulic cylinder 18 in the direction of arrow A causes rotation of the lever members 14 through an angle B. Because both lever members 14 are identical as far as the angles and distances from pivot 15 to the pivoting points of links 16 and bar 17 and because the distance between the pivoting points of bar 17 is equal to the distance between pivots 15, links 16 move down a distance in the direction C which is identical at both ends of ram 12. It is therefore seen that the mechanical linkages 13 and bar 17 ensures parallel movement of ram 12 with respect to bed 11.

I claim:

1. A press brake for use in cold metal working comprising:
   - a frame;
   - a bed mounted on said frame;
   - a ram adapted to move towards said bed;
   - mechanical linkages located one at each end of said ram for interconnecting said ram to said frame, said mechanical linkages comprising a lever member located adjacent each end of said ram and pivotally connected to said frame, two links interconnecting each end of said ram to each lever member, said links being positioned one on each side of said ram, and a bar interconnecting the other ends of said lever members;
   - operating means connected to said bar to pivot said lever members simultaneously to ensure parallel movement of said ram towards said bed regardless of uneven loading of the press; and
   - an adjusting wedge located adjacent each end of the bed for tilting the bed.

2. A press brake as defined in claim 1, wherein said operating means is a hydraulic cylinder.

3. A press brake as defined in claim 1, wherein each adjusting wedge comprises a first wedge member secured to said frame, said first wedge member having a first inclined surface, a second wedge member secured to said bed, said second wedge member having a second inclined surface mating with said first inclined surface, and means for sliding said second wedge member on said first wedge member to tilt said bed.



4. A press brake as defined in claim 3, wherein said means for sliding said second wedge member on said first wedge member comprises a bracket secured to said first wedge member and a bolt protruding through said bracket and threaded to said second wedge member.