

[54] **UNIVERSAL AUTOMATIC BENDING PRESS**

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[58] Field of Search. 113/120 E, 120 G; 72/394, 396, 72/404, 418, 427, 455, 472, 252

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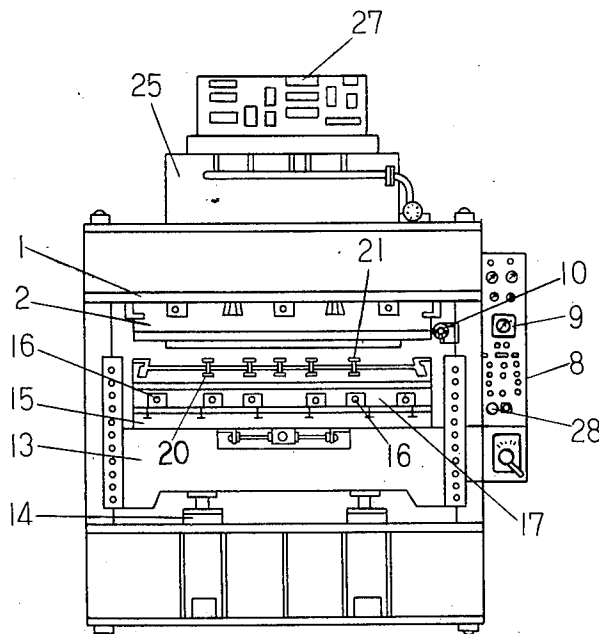
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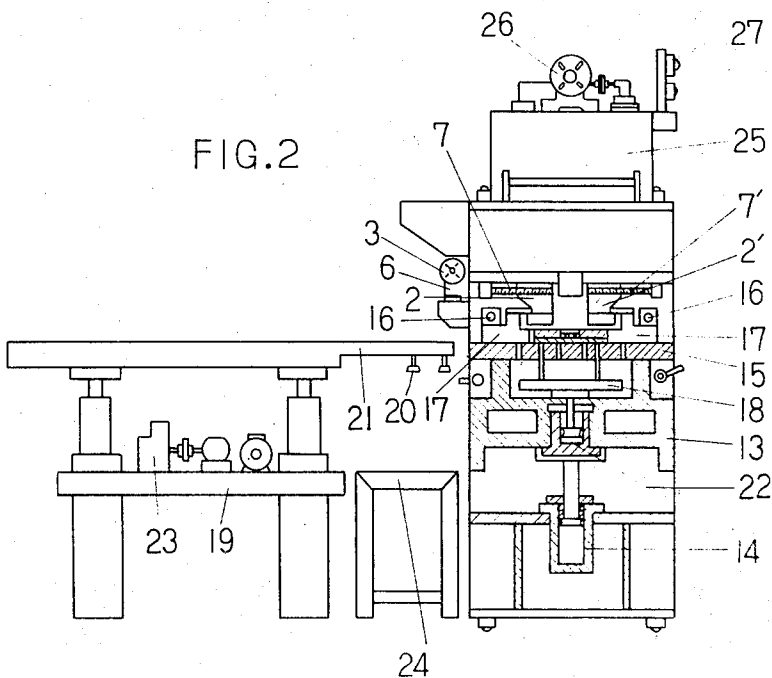
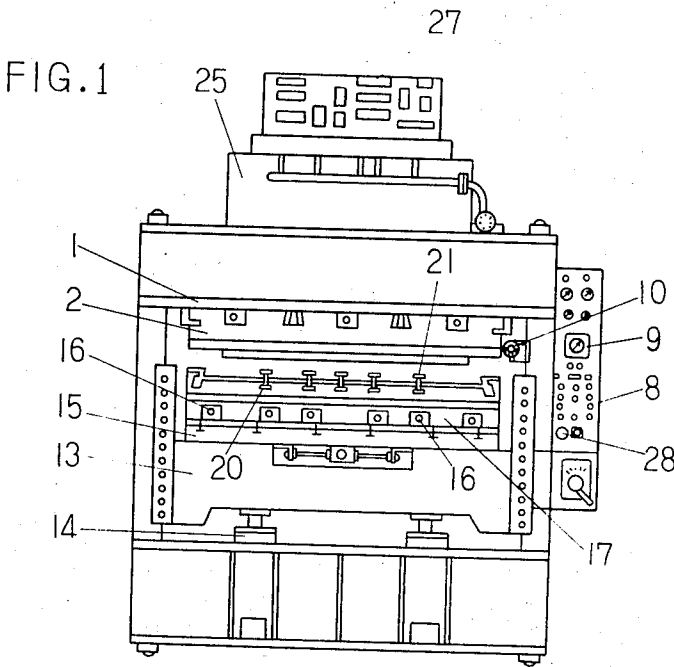
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[57] **ABSTRACT**

A universal automatic bending press comprising a pair of male die holders movable towards and away from each other, a pair of female die holder, provided with operating cylinders and capable of performing the same movement as said male die holders, said male and female die holders being adapted to cooperate with each other so as to press and deform the work therebetween to the desired shape, a vertically movable table provided with a bolster having mounted thereon said female die holders, and an unloader having suction means movable into the machine frame upon completion of the bending operation for delivery of the bent pieces from said machine frame, the working components above depicted being adapted for cooperating with each other automatically for performing the bending operation.

**1 Claim, 5 Drawing Figures**





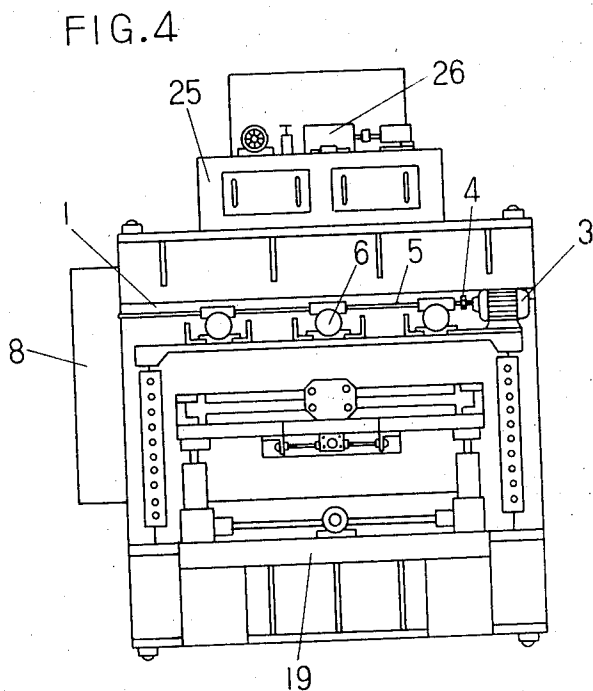
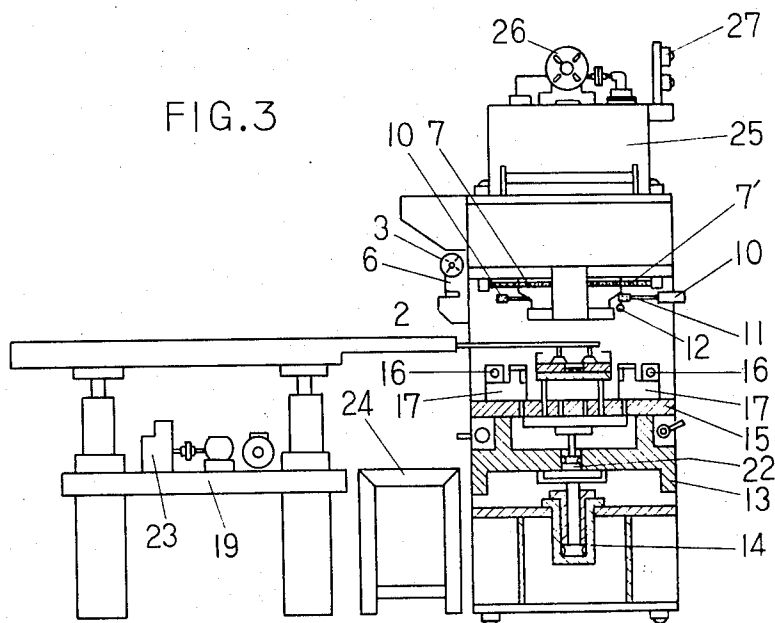
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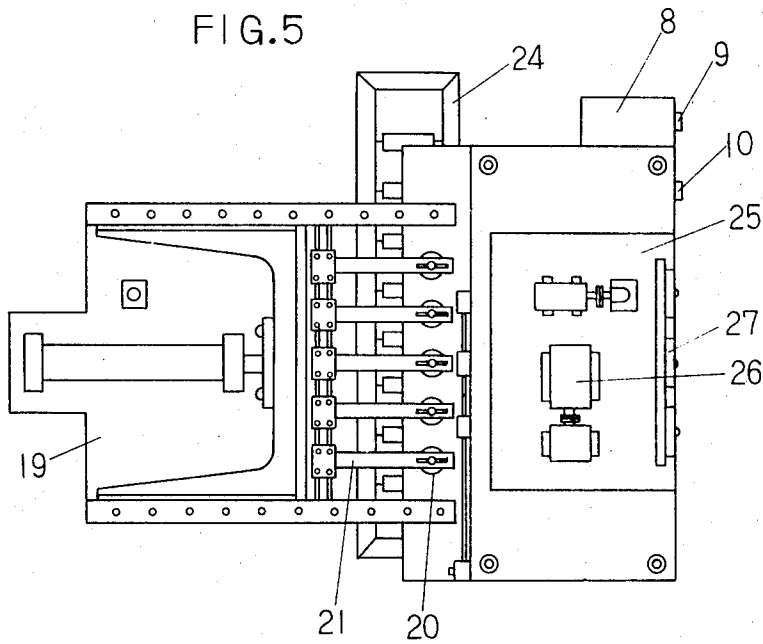


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**UNIVERSAL AUTOMATIC BENDING PRESS**

This invention relates to an automatic bending press of the universal type.

A main object of the present invention is to provide a bending press whereby the work may be bent into various complicated shapes through highly simplified operation.

Another important object of the present invention is to provide a bending press whereby the optimum operating safety may be attained with considerable reduction of labor.

A preferred embodiment of the present invention will be now described in detail in conjunction with the accompanying drawings, in which:

FIG. 1 is a front view of the universal automatic bending press according to the present invention;

FIG. 2 is a side elevational view thereof, shown partly in section, and shown in an operative phase in which the work is being bent into the desired shape;

FIG. 3 is a similar view to FIG. 2, shown in an operative phase where the bending operation has been completed;

FIG. 4 is a back side view thereof; and

FIG. 5 is a plan view thereof, shown partly in section.

In the conventional bending presses, the work is held on a support bolster which is vertically movable relatively to the machine frame. In this bending presses, the work held on the bolster may frequently be fed under the off-center placing condition in the course of the bending operation. Moreover, the work must be manually shifted or reversed in the bolster when desired to obtain a highly complicated or contoured shape. This results in a considerable waste of labor and an inefficient and often inaccurate bending operation. Moreover, such a bending process is highly detrimental to the maintenance of the operating safety.

The present invention is proposed to eliminate above drawbacks inherent in the conventional bending machine. There is provided, in accordance with the present invention, a universal automatic bending press comprising a pair of male die holders 2 movable towards and away from each other, a pair of female die holders 17 provided with a number of operating cylinders 16 and capable of performing the same movement as said male die holders, said male and female die holders being adapted to cooperate with each other so as to press and deform the work held therebetween to the desired shape, a vertically movable table 13 provided with a bolster 15 having mounted thereon said female die holders, and an unloader 19 having suction means displaceable into the interior of the machine frame for delivery of the bent pieces from said machine frame, upon completion of the bending operation, the working components above depicted being adapted for performing the bending operation automatically and cooperatively with each other.

Referring to the drawings, there is shown a preferred embodiment of the present invention. A machine frame 1 has housed therein the above-mentioned components, except the unloader device 19. The machine frame 1 is provided at the substantially middle portion thereof with a chamber opened to both front and rear walls of the frame 1. For the convenience of description, the machine frame 1 is divided into an upper part and a lower part with respect to the middle chamber. A threaded spindle provided beneath the upper part of

the frame 1 includes a left-hand threaded part 7 and a right-hand threaded part 7', as seen in FIG. 2. Male die holders 2 and 2' are threadedly mounted on the threaded parts 7 and 7', respectively. A reversible motor 3 having a driving shaft 4 is secured to the lower side of the upper part of the machine frame 1. The male die holders 2 and 2' are provided with reduction gears 6 operatively connected to an intermediate shaft 5 and the driving shaft 4 which are both extended in perpendicular relation to the threaded spindle parts 7 and 7'. It will be thus understood that rotation of the reversible motor 3 causes linear movement of the die holders along the threaded spindle parts 7 and 7' and whether the male die holders are moved towards or away from each other depends upon the rotational direction of the reversible motor 3. Determination of the distance between opposite male die holders 2 and 2' may be effected by means of a limit switch 12 for limiting the movement of the die holders 2 and 2' towards and away from each other. The limit switch 12 is arranged on a threaded rod 11 mounted at the right-hand corner on the front surface of the machine frame 1, as best shown in FIG. 3. The threaded rod 11 has on its opposite ends a motor 10 for moving the limit switch 12 and a synchro transmitter. Further provided in a consol box 8 is a synchro receiver 9 the scale of which is aligned with the determined distance between opposite male die holders 2 and 2' by initial position adjustment of the synchro receiver on the threaded rod 11.

The motor 10 for moving the limit switch 12 is reversibly driven by operation of a push button 28 and a selector switch. Depression of the push button 28 causes rotation of the threaded rod 11 where by the limit switch 12 is moved to a determined position which corresponds to the pointed scale in the synchro receiver. Thus, the limit switch 12 controls the movement of the male die holders 2 and 2'.

The table 13 is mounted on the top of the lower part of the machine frame 1 in symmetry with the male die holders 2 and 2' with respect to the horizontal plane and is also connected with hydraulic cylinders 14. The table 13 has further mounted thereon a bolster 15 on which is set female die holders 17 and 17 in opposed reaction to the male die holders 2 and 2'. The female die holders 17 and 17 are provided with female dies (not shown) and several laterally thrusting cylinders 16. A die cushion bolster 18 secured to the table 13 serves as a support or rest for the work which is under the bending operation. When the table 13 has been raised to its uppermost position where the work is brought into contact with the male dies, the bolster 18 is abutted against the reverse side of the work so as to effectively prevent the work from being wrinkled. When the work is deformed into a U-shape, the laterally thrusting cylinders 16 and 16 secured to the die holders 17 and 17 are actuated to fold inwardly the opposed longitudinal edges of the U-shaped work. Upon completion of the bending operation, the die holders 2 and 2' are again moved towards each other and the lower flanged parts on the die holders 2 and 2' are released from the foremost edges of the work bent in the U-shaped configuration.

At this time, the table 13 is lowered and the unloader 19 moves upwardly. As a result, the suction cups 20 secured to the movable arm 21 are moved into the in-

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terior of the machine frame 1 and then lowered to the predetermined position. Simultaneously, an ejector cylinder 23 and a vacuum pump 22 are actuated to cause the suction cups 20 to take up the product. Then, the product is withdrawn out of the machine frame 1 and dropped onto a conveyor belt 24.

The above-mentioned operation of the bending press according to the present invention may be performed automatically by manually depressing the push button 28 provided on the lateral side of the frame 1 for driving hydraulic circuit including the vacuum pump 23, pump motor 26, an oil tank 25 and a hydraulic device 27.

It is to be noted that, according to the present invention, the bending operation may be performed in a variety of ways by simply modifying the shape of the die blocks fitted on the operating cylinders 16. For example, one or both of the opposed longitudinal edges of the U-shape may be bent outwardly or inwardly.

What is claimed is:

1. A universal automatic bending press comprising a pair of male die holders movable towards and away

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from each other, a pair of female die holders provided with operating cylinders and capable of performing the same movement as said male die holders, said male and female die holders being adapted to cooperate with each other so as to press and deform the work therebetween to the desired shape, a vertically movable table provided with a bolster having mounted thereon said female die holders, and an unloader having suction means movable into the machine frame upon completion of the bending operation for delivery of the bent pieces from said machine frame, the working components above depicted being adapted for cooperating with each other automatically for performing the bending operation, said male die holders being threadedly mounted on a spindle having a left-hand threaded portion and a right-hand threaded portion whereby said male die holders are movable towards and away from each other when said spindle is driven rotatably in either of opposite directions, and the female die holders are also mounted so as to make movement corresponding to that of said male die holders.

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