United States Patent [19]

Hix

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[54] **PRESS BRAKE DIE STRUCTURE INCORPORATING GATE MEANS**

[76] Inventor: **Alfred G. O. Hix**, 3032 Rancho La Carlota, Covina, Calif.

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[52] **U.S. Cl.** **72/461**

[51] **Int. Cl.** **B21d 11/22**

[58] **Field of Search** 72/461, 36, 380, 72/385, 386, 389

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Primary Examiner—Charles W. Lanham
Assistant Examiner—Gene P. Crosby
Attorney—Nilsson, Robbins, Wills & Berliner

[57] **ABSTRACT**

Die structures for press brakes are disclosed, in which the actual dies are elongated structures having a substantially uniform cross section, and further include a support structure, to which a gage means is affixed for supporting stops or guides to establish the position of a workpiece with reference to the dies.

2 Claims, 5 Drawing Figures

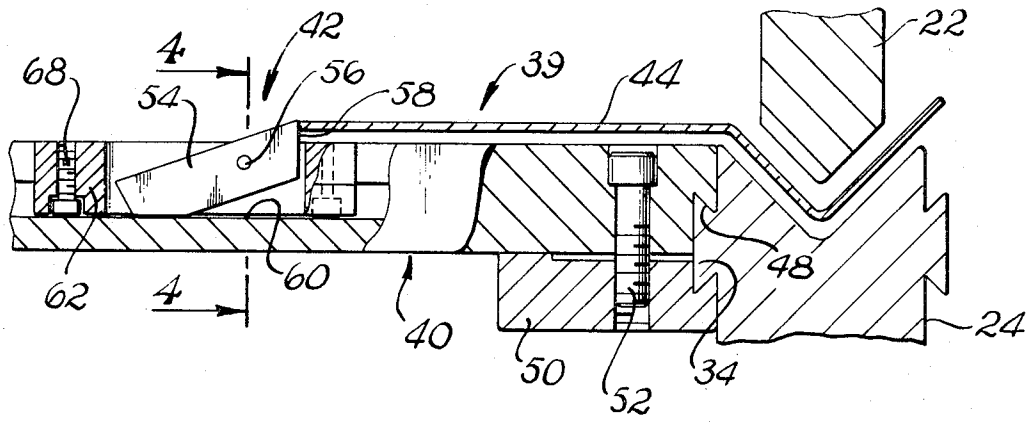


Fig. 1.

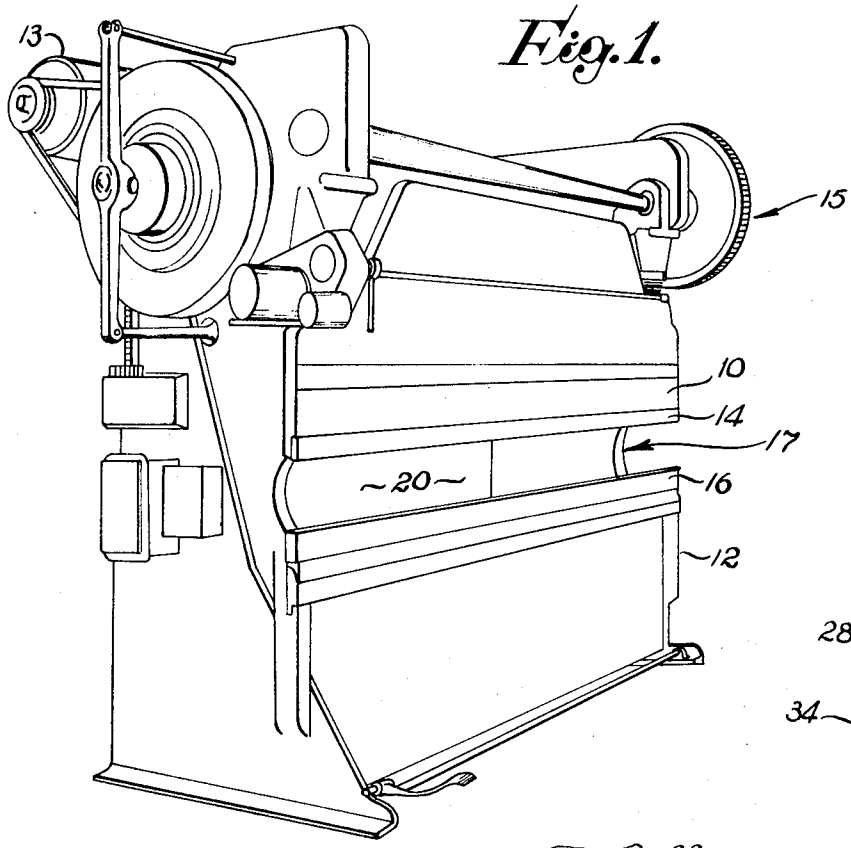
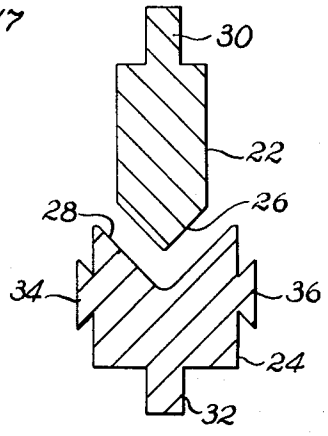


Fig. 2.



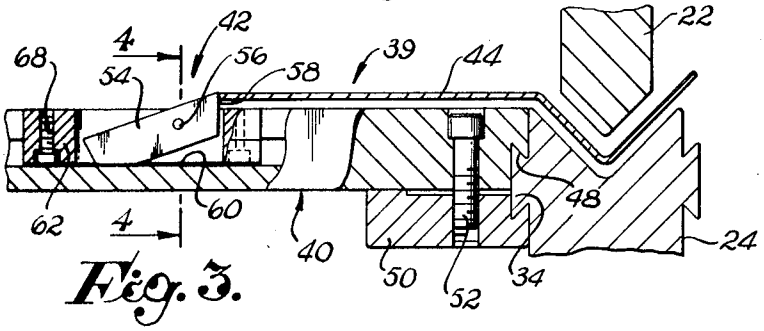


Fig. 3.

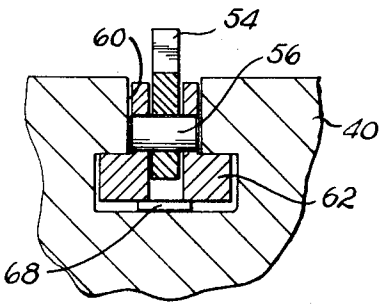


Fig. 4.

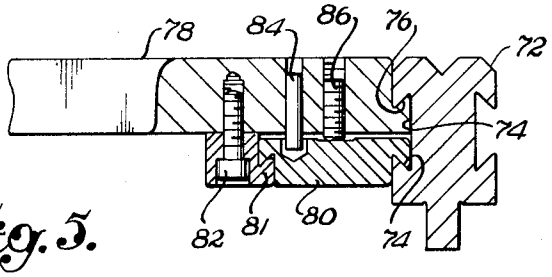


Fig. 5.

INVENTOR.
ALFRED G. O. HIX
BY
NILSSON, ROBBINS, WILLS AND BERLINER
ATTORNEYS

PRESS BRAKE DIE STRUCTURE INCORPORATING GATE MEANS

BACKGROUND AND SUMMARY OF THE INVENTION

Conventionally, press brakes utilize forming dies, for bending or shaping sheets of metal or the like in two dimensions only. For example, such machines might be used to accomplish uniform channels, troughs or gutters from a plane sheet of metal. Forming operatiOns by a press brake may involve several individual steps performed upon a single workpiece. For example, complex cross-sectional members may be developed by using several different sets of dies, or a single set of press dies might be used to form a sheet section-by-section, as for example, to a uniformly corrugated shape.

Normally in using a press brake, it is important to align a predetermined section of each workpiece with the mating press brake dies. Of course, in multiple-stamping operations, the need arises for establishing a plurality of related positions for the workpiece to accomplish the stamping operations at predetermined related locations and attain the desired configuration. Press brakes usually incorporate gages or guide members for receivably engaging a workpiece to limit the extent to which the workpiece may be inserted between the mating dies. Thus, setting the gages for a particular operation, establishes the section of the workpiece that will be deformed. Conventionally, these gage structures are affixed to the press brake and generally a significant amount of set-up time is required in their placement and adjustment. Accordingly, a need exists for an improved structure for use in press brakes for facilitating completed set ups of the dies and gages.

In general, the present invention contemplates the formation of press brake dies by the utilization of extrusion techniques. As a consequence, a support structure is economically integrally formed as a portion of one of the dies, to which support, structure gage means are affixed for holding a stop means to receivably engage and thereby position a workpiece.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings, disclosing illustrative embodiments of the present invention to present the various objects and advantages thereof, set forth as follows:

FIG. 1 is a perspective view of a press brake machine of the type utilizing the die structure of the present invention;

FIG. 2 is a sectional view of a somewhat-typical pair of press brake dies incorporating the structure of the present invention;

FIG. 3 is a sectional view of an apparatus incorporating the present invention;

FIG. 4 is a sectional view taken along line 4—4 of FIG. 3; and

FIG. 5 is a sectional view of an alternative structure for a portion of the apparatus of FIG. 3.

DETAILED DESCRIPTION OF THE ILLUSTRATIVE EMBODIMENTS

Referring initially to FIG. 1, there is shown a press brake machine as well known in the prior art and widely used in the production of elongated uniform-cross section members. The various detailed aspects of the press brake as depicted in FIG. 1 are not particularly pertinent to the present invention, excepting the press members 10 and 12 which receivably support a pair of elongated press brake dies 14 and 16 for mating engagement to shape a workpiece. Generally, the press brake as illustrated incorporates an electric drive motor 13 for motivating a rotary structure 15 (generally indicated). A substantial frame 17 supports the rotary structure as well as a mechanism (not shown) for converting rotary drive power to reciprocating drive for the members 10 and 12. Press brakes of this configuration are well known in the metal shaping industry.

The stationary die 16 is supportably affixed to the press member 12, while the moving die 14 is affixed to the horizontally movable press member 10. Of course, various drive means as well known in the prior art may be utilized to actuate the press member 10 through a horizontal stroke to matingly engage the dies 14 and 16 during a forming operation.

In using the machine as shown in FIG. 1, a workpiece, usually of sheet metal or other flat stock, is inserted into the space 20 between the dies 14 and 16 to a depth indicated by a gage structure (not shown) then the machine is actuated causing the moving die 14 to travel through a horizontal down stroke, matingly engaging the dies 14 and 16 to deform the workpiece. The forming stroke is followed by a return stroke during which the dies separate. On the completion of such a cycle of operation, the workpiece may be removed or, alternatively, may be inserted to another index position at which another forming stroke shapes another section of the workpiece.

In the operation of the machine (FIG. 1) to accomplish various shapes, means are conventionally provided for gaging the depth to which a workpiece may be inserted between the dies 14 and 16 into the opening 20. Accordingly, gages (not shown) have been conventionally affixed to the machines to provide a limit stop for gaging the depth to which the workpiece may be inserted. Generally, the present invention contemplates the provision of a die structure for use in a press brake machine, which incorporates an effective, simple and economical gaging apparatus to provide limit stops for positioning the workpiece with regard to the dies 14 and 16.

Of course, it is basic to a press brake as depicted in FIG. 1 that the dies may take various forms in accordance with the shapes desired to be formed in a workpiece. For example, as shown in FIG. 2, a pair of sectionally represented dies 22 and 24 matingly engage along an external surface 26 of the die 22 and an internal surface 28 of the die 24. In the illustrative dies, the mating surfaces 26 and 28 distort the workpiece therebetween to accomplish an elongated trough extending along the full length of the mating dies 22 and 24.

As indicated, the dies 22 and 24 include elongated shank sections 30 and 32 which are employed for affixing the dies 22 and 24 respectively into the press brake (FIG. 1). The stationary (lower) die 24 also incorporates a pair of support structures 34 and 36 on opposite sides of the die. In the specific die configuration of FIG. 2, the support structures 34 and 36 are in the form of elongated reverse-tapered lateral male extensions to which a mating clamp may be readily affixed. Of course, the form of the support structures 34 and 36 as well as the nature of the surfaces 26 and 28 may vary widely depending upon the particular design consider-

ations, the specific press brake, and the nature of the forming operations.

With regard to the dies 22 and 24, and particularly the die 24 (incorporating the support structures) it is important to appreciate that the shape thereof may be accomplished, at least in part, by the use of extrusion techniques. That is, as the dies 22 and 24 are elongated members with uniform cross sections, these structures may be formed by processes which utilize extrusion techniques. Subsequent to such extrusion forming, it may be necessary to perform some further processing to attain desired accuracy; however, an important consideration in relation to the present invention resides in the fact that the support structures, e.g., structures 34 and 36, may be integrally formed with the dies, e.g., die 24, during an extrusion process and thereby afford support for a gage structure for positionIng the workpiece in a press brake. Thus, the die 24 may be an integral, extruded member, defining a forming surface (surface 28), a holding section (section 32) and a support structure (structure 34).

Referring to FIG. 3, the dies 22 and 24 are fragmentarily shown with the gage structure 39 supportably affixed to the support structure 34. Specifically, a gage bar 40 extends normally away from the die 24 to receive a stop mechanism 42 for abutting a workpiece 44 to positionally align a section of the workpiece 44 between the dies 22 and 24. The gage bar 40 terminates at the right, as shown, to define an internally flared shoulder 48 for mating engagement with the support structure 34 along with a clamping member 50 which is affixed to the bar 46 by a stud 52. Thus, the opposed shoulders of the support structure 34 clampingly receive the gage structure 39.

The stop mechanism 42 includes a latch bar 54 which is pivotally mounted by a pin 56 (FIG. 4). The bar 54 is unbalanced whereby the stop end 58 (right FIG. 3) normally extends above the gage bar 40 to receive the workpiece 44 in abutting relationship.

The gage bar 40 defines an internal channel 60 of inverted T-shape cross section, which receives the stop mechanism 42 in sliding engagement. Specifically, a block 62 carries the pin 56 (FIG. 4) and a locking stud 68 (FIG. 3). Turning the stud 68 down against the bottom of the channel 60 locks the stop mechanism in a desired location.

Considering the operation of the system hereof, a pair of dies as the dies 22 and 24 are initially selected to accomplish a predetermined deformation (two dimensional) of a workpiece 44. Next, the location of the specific contact areas on the workpiece by the dies is determined. To accomplish that location, the stop mechanism 42 is set (FIG. 3) a predetermined distance from the mating location of the dies 22 and 24, and locked in position by the stud 68. The stop mechanism 42 may be easily set and locked after the gage bar 40 has been affixed to the die 24 by turning the stud 68 into the block 62.

In view of the linear (uniform cross-sectional configuration) nature of the dies 22 and 24, the gage bar 40 may be used in plurality and variously positioned along the length of the die 24 with convenience and ease. Also, the gage bar 40, singularly or in plurality, may be conveniently affixed to the die 24 either before or after the die is inserted in the press brake. Generally, the placement of the stop mechanisms 42 prior to placing the die 24 in the press brake may afford added convenience and accuracy in executing the preliminary set-up operations.

After a particular set up has been used, the dies 22 and 24 may be removed along with the gage structure 39 and replaced by other dies for a relatively short run, after which the dies 22 and 24 may be returned to the press brake. That is, the present system enables removal of the dies along with the entire set up, whereby to enable intervening use of the machine with another set up. Consequently, set-up die structures which are to be used repeatedly may be left with the gage bars affixed to the dies during intervals of nonuse so that such set ups may be established in the press brake quickly and easily preparing the machine for operation.

As indicated above, the detailed structure for supporting the gage bars in relation to the dies may take a variety of forms different from that illustrated by FIG. 3. Specifically, for example, the die may incorporate a linear channel for supporting the gage bars. As shown in FIG. 5, a die 72 has a uniform channel 74 defining opposed shoulders, and which is internally flared for mating engagement with an end shoulder 76 defined in a gage bar 78, and a shoulder formed on a clamping member 80. The clamping member 80 is affixed to the gage bar 78 by a keeper 81 and a stud 82 that is threadably received in the gage bar 78. A pin 84 serves to lock the clamping member 80 along with the keeper 81. A headless stud 86 is variously received in the gage bar 78 to extend therefrom in engagement with the locking member 80 to spread the structure within the channel 74 and afford a locking relationship.

Summarizing, the system hereof enables increased flexibility in the use of dies in press brake machines with substantially no increased effort or cost. The latter consideration is particularly true in the event that the dies are formed by extrusion techniques whereby the support member defined in the die may be provided by simple modification of the extrusion dies. Thus, the system hereof affords an improved structure for use in press brake machines. As indicated, the system hereof may be embodied in a large variety of different die types as well as various forms for the individual components of the system. Consequently, the scope hereof is to be defined in accordance with the claims set forth below.

What is claimed is:

1. A press brake die structure for use in a press to form a workpiece of substantially flat stock, comprising:

first and second elongated, mating die members adapted to be received in said press for engagingly forming a said workpiece, at least one of said die members integrally defining an elongated form including a pair of opposed shoulders;

gage means including a gage bar defining a channel along the length thereof and clamp means for engagement with said opposed shoulders affixed to said support structure said gage means extending normally away from said die members; and

stop means affixed to lie in said channel defined in said gage bar for receivably engaging a said workpiece, to limit the extent said workpiece is inserted between said die member.

2. A die structure according to claim 1 wherein said stop means includes an abutment member and a pivot means for movably supporting said abutment member to move into and out of said gage means.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,740,996 Dated June 26, 1973

Inventor(s) ALFRED G. O. HIX

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet [54] and column 1, line 2, "GATE" should read -- GAGE -- . Column 1, line 10, "operati0ns" should read -- operations -- . Column 3, line 17, "positionIng" should read -- positioning -- .

Signed and sealed this 25th day of December 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER,JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

FORM PO-1050 (10-69)

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