ABSTRACT OF THE DISCLOSURE

A brake for bending a workpiece comprising; a frame having a fixed jaw and a movable jaw; an anvil adjustably secured to the fixed jaw; the movable jaw having a clamping surface movable between workpiece clamping and non-clamping positions relative to the anvil; means for releasing locking the movable jaw in workpiece clamping position; a bending member hingedly connected to the fixed jaw; and a spring-loaded floatable compensator pivoted to the bending member and having a surface bearing on the workpiece.

CROSS REFERENCES TO RELATED APPLICATIONS

This is a continuation-in-part of my copending application, Ser. No. 646,963, filed June 19, 1967.

BACKGROUND OF THE INVENTION

Field of the invention

Apparatus for bending sheet metal wherein the workpiece is clamped between a pair of jaws and a bending member hinged to one of the jaws bears against the workpiece to bend it into the desired angular shape.

Description of the prior art

Brakes of the prior art have been expensive in their manufacture, cumbersome and complicated in their structure and unreliable in their use. Too, they usually scratch the workpiece in the area of the bend and they are unable to accept workpieces having a preformed bead or flange.

SUMMARY OF THE INVENTION

The invention provides a brake which is easy to transport and set up, which is extremely reliable and versatile in its use, and which will not scratch or scratch the surface of the workpiece in the area of the bend.

The invention provides a brake which will accept either flat sheet metal stock or stock which has been provided with a preformed bead or flange.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a brake embodying the invention;

FIG. 1A is a fragmentary view in perspective of a modified form of handle means for the brake;

FIG. 2 is an enlarged, fragmentary end elevational view showing the brake in working clamping position, with portions of the brake broken away for clarity;

FIG. 3 is a fragmentary view similar to FIG. 2 showing the action of the brake clamping member in its movement between non-clamping and clamping positions;

FIGS. 4 and 5 are fragmentary views similar to FIG. 3 showing the action of the several bending bar components during the bending of a workpiece;

FIG. 6 is an enlarged, fragmentary top plan view of the hinge means and hinge compensator of the brake of the invention; and

FIGS. 7-8 are fragmentary somewhat schematic end elevational views of a brake embodying a modified form of locking means.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The brake is so organized and designed that it may be placed upon a bench, pair of horses, or like supporting contrivances (not shown) so as to dispose the brake at a convenient height above the ground or floor for operating purposes.

The brake is organized with reference to a bed or table in the form of a pair of generally channel-shaped rails 10 and 12 formed preferentially of aluminum extrusions and disposed in spaced parallelism as to each other.

Conceivably, a single rail of adequate dimensions could be used in lieu of the pair of such rails.

Longitudinally-spaced C-shaped frames numerically designated by reference character 14 are provided, each including a lower arm 16 which is so designed as to define a front side face recess 18 to which rail 10 is bolted as by bolts 20 and a rear side face recess 22 to which rail 12 is bolted as by bolts 24, the C-frames also including an upper arm 26 as by bolts 28 which overlies the lower arm in spaced relation thereto, whereby is provided an open jaw.

A lower jaw 28 is formed integrally with rail 10 and has an inner edge overlying the upper planar surface of lower arm 16 adjacent the forward edge thereof; a bending bar 32 in the form of an aluminum extrusion having generally the shape of the numeral 6 is hinged to the forward edge of jaw 28.

One or more bending bar handle members 34 are fixed to the bending bar for facilitating movement thereof, the handle members either depending from the bending bar, as shown in FIG. 1, or extending upwardly therefrom, as shown in FIG. 1A.

The forwardly-facing longitudinal edge of lower jaw 28 and the rearwardly-facing longitudinal edge of a substantially upright extension 33 of bending bar 32 are formed with mating integral projections 35 and 37 respectively, best seen in FIG. 6, which projections are provided with openings coaxially aligned when the projections are intermeshed so that a pin 36 may be extended through the openings to complete the hinge. In this manner, bending bar 32 is hinged to lower jaw 28 along an axis.

A shiftable anvil plate 38 is provided in overlying relationship to the upper planar surface of lower jaw 28 and is adjustable secured thereto by means of screws 40 which extend through elongated slots 42 in the lower jaw and are threadedly engaged in anvil plate 38.

As shown in FIG. 2, the anvil plate may be shifted rearwardly relative to the lower jaw to provide a suitable recess immediately adjacent the hinge connection between the bending bar and lower jaw, in which recess the present portion B of a sheet-metal workpiece W is receivable.

For the usual flat sheet-metal workpiece, as shown at X in FIGS. 3-5 and 7-9, the anvil plate is shifted forwardly so that its leading or forward longitudinal edge is disposed closely adjacent the aforementioned hinge connection.

A generally L-shaped floating hinge compensator 44 is disposed in overlying relationship to the outwardly-facing face of extension 33 of bending bar 32 and is provided along its outermost longitudinal edge with a foot portion 50 which normally overlies the outwardly facing surface defined by the hinge connection between the bending bar and the lower jaw so as to be disposed above the plane of the working surface of anvil plate 38.
Foot portion 50 normally rests upon a plurality of longitudinally-spaced, axially-aligned plastic rollers 51 mounted upon a pin 53 provided along the upper edge of extension 33 of bending bar 32, in manner as best seen in FIG. 6. Conceivably, a single elongated roller could be employed, if desired.

My construction is such that I can use the compensator alone, without the rollers, or the rollers alone, without the compensator, or the compensator and rollers in combination, as herein illustrated.

An abutment 55 provided along the outermost longitudinal edge of the bending bar and spaced from extension 33 serves to contain a plurality of compression springs 57 wedged between the abutment and the lower end of hinge compensator 44.

As shown in FIGS. 2 and 3, when the bending bar is in non-use position, the foot portion of the hinge compensator overlaps the hinge connection, rests on the rollers 51, and is disposed in a horizontal plane above that of anvil plate 38.

As the bending bar is swung upwardly from the FIG. 3 position to the FIG. 4 position, the compensator pivots at its lower end against the tension of springs 57, with foot portion 50 thereof and the rollers 51 of the bending bar riding upwardly relative to the lower planar surface of the workpiece, which is clamped relative to the anvil plate by a clamping subassembly to be described.

When the workpiece has been bent to the desired angular shape, the bending bar is swung downwardly whereupon the foot portion of the compensator and the rollers of the bending bar ride downwardly until the foot portion returns to its normal position wherein it overlies the rollers and hinge connection.

The floating compensator and rollers or compensator alone, or rollers alone, preclude any scraping or marring of the finish of the workpiece during the bending operation.

The clamping subassembly, generally indicated by 52, includes a clamping member 54 provided with sharp tapered lowermost front and rear edges defining a flat clamping surface 56 which is coextensive in length and width with anvil plate 38, the clamping surface preferably, but not necessarily, having a boat 58 of suitable hard, wear-resistance material in the nature of stainless steel or the like sleeved thereon for better wearability.

Clamping member 54 is fixed at its opposite upper end as by bolts 60 or other suitable means to the lower surface of a channel-shaped pivot bar 62 which is pivoted at its opposite innermost end to upper arm 26 of each C-frame 14 as by a pivot pin 64.

A handle member 66 is linked to the pivot bar, whereby the clamping member may be moved into overlying relation to the stationary anvil plate to clamp the workpiece of sheet metal against the flat surface of the anvil plate in clamping relation.

Handle member 66 is pivoted along one of its edges as by a pivot pin 68 to the forward end of upper arm 26 of each C-frame 14 and is pivotally connected to pivot bar 62 by a pair of short links 70, 70 pivoted at their upper ends as at 72 to an edge of the handle member and at their lower ends as at 74 to the pivot bar.

A tension spring 76 is fixed at one end to upper arm 26 and at its opposite end to pivot bar 62 may optionally be provided to spring-load clamping subassembly 52.

Locking means is provided for releasably locking the clamping subassembly in workpiece clamping position. One form thereof is shown in FIGS. 1-3 and an alternative form thereof in FIGS. 7-9.

With reference to the embodiment of FIGS. 1-3, the locking means comprises a locking block 78 pivotally mounted at its inner end within each pivot bar 62 on the pivot pin 74 and on a pivot pin 80, each of which extends through the pivot bar.

An adjustment screw 82 threaded in locking block 78 adjacent the forward end thereof extends outwardly therefrom and has a lower end which abuts the lower wall of pivot bar 62. Rotation of the adjustment screw causes the locking block to pivot relative to the pins 74 and 80 thereby raising or lowering the block to raise or lower the position of a locking bolt 84 threaded in the block and having its head disposed upwardly of the upper planar surface of the block.

The head 86 of a screw 88 threadedly engaged in handle member 66 is moved into contact with the head of locking bolt 84 when the handle member is rotated in a counterclockwise direction, thereby effectually locking the clamping subassembly. Rotation of the handle member in an opposite direction moves screw head 86 out of contact with bolt 84 to unlock the clamping subassembly.

In the embodiment shown in FIGS. 7-9, the bolts 84 and 88 are omitted, locking and unlocking being achieved by movement of handle 66 so that the pivotal connection 72 between the upper ends of links 70 and the handle member is disposed first on one side of an imaginary center line Z—Z passing through the pivotal connections 68 and 74 and then on the other side of said imaginary line.

A bolt 87 threaded in upper arm 26 of C-frame 14 functions as a stop when contacted by handle member 66 to preclude overtravel of the clamping subassembly.

FIG. 7 shows the unlocked position, with the clamping subassembly raised and with pivot 72 being disposed to the left of imaginary line Z—Z which passes through pivots 68 and 74.

FIG. 8 also shows the unlocked position, but with the clamping subassembly lowered and the imaginary line Z—Z passing through each of the pivots 68, 72 and 74. FIG. 9 shows the locked position, with the clamping subassembly lowered and locked relative to anvil plate 38, with pivot 72 being disposed to the right of imaginary line Z—Z and with handle member 66 contacting stop bolt 87.

To unlock the device, the handle member is rotated in a clockwise direction to swing pivot 72 to the opposite side of line Z—Z.

The upper surface of the lower arm 16 of each C-frame 14 may be stepped as at 90 at measured intervals along its length, the steps being adapted to receive the inner edge of a workpiece therereagainst and being marked with suitable indicia 92 inscribed on lower arm 16 to indicate the precise location of the bend to be placed in the workpiece.

In use, a workpiece is properly positioned relative to lower arm 16 so that it rests upon anvil member 38 and foot portion 50 of hinge compensator 44, the anvil member first having been positioned according to the presence or absence of a prebent portion in the workpiece.

Handle member 66 is now swung downwardly to bring clamping surface 56 of clamping member 54 into contact with the upper planar surface of the workpiece and the handle member is rotated to bring the head 86 of screw 88 into contact with the head of the locking bolt 84 provided in locking block 78, or to move pivot 72 past imaginary line Z—Z, thereby effectually locking the clamping subassembly relative to the workpiece and anvil member.

Bending bar handle member 34 is now swung upwardly to cause the foot portion 50 of the compensator 44 to pivot upwardly relative to bending bar 32 thereby causing the workpiece to bend along the forward edges of the anvil plate and clamping member.

When the workpiece has been bent to the desired angle, bending bar handle member 34 is swung downwardly and the compensator 44 returns to its rest position.

The combination of the floating compensator and rollers, or the compensator alone, or the rollers alone, makes for easier bending and precludes marring of the surface of the workpiece during the bending operation.

The brake is so designed that a plurality thereof may be coupled together as by coupling means 94, see FIG. 1,
to accept workpieces of virtually any length, with reinforcing bars 96 being provided and extending between the rails 10 and 12 to impart added strength and rigidity to the composite structure.

I claim:

1. A sheet metal brake comprising:
   (a) a frame having a fixed jaw and a movable jaw;
   (b) an anvil adjustably secured to said fixed jaw;
   (c) said movable jaw having a clamping surface movable between workpiece clamping and non-clamping positions relative to the anvil;
   (d) means for releasably locking the movable jaw in workpiece clamping position;
   (e) bending means hingedly connected to the fixed jaw; and
   (f) means pivoted to the bending means including a spring-loaded compensator having a surface bearing on a workpiece and a plurality of rollers for bending a workpiece.

2. A sheet metal brake according to claim 1, wherein said anvil is shiftable relative to said fixed jaw for providing a recess adjacent the hinge connection between the bending means and fixed jaw in which recess the prebent portion of a workpiece is receivable.

3. A sheet metal brake according to claim 1, including a wear-resistant boot sleeved on the clamping surface of the movable jaw.

4. A sheet metal brake according to claim 1, wherein the means for releasably locking the movable jaw in workpiece clamping positions comprises, a handle pivoted to the movable jaw, first locking means on the handle and second locking means on the movable jaw.

5. A sheet metal brake according to claim 1, including stepped indentations and indicia on the fixed jaw.

6. A sheet metal brake according to claim 1, including, a hollow handle member linked to the pivot bar for moving the clamping member into overlying relation to the shiftable anvil plate for clamping the workpiece against the anvil plate.

References Cited

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MILTON S. MEHR, Primary Examiner