

April 30, 1968

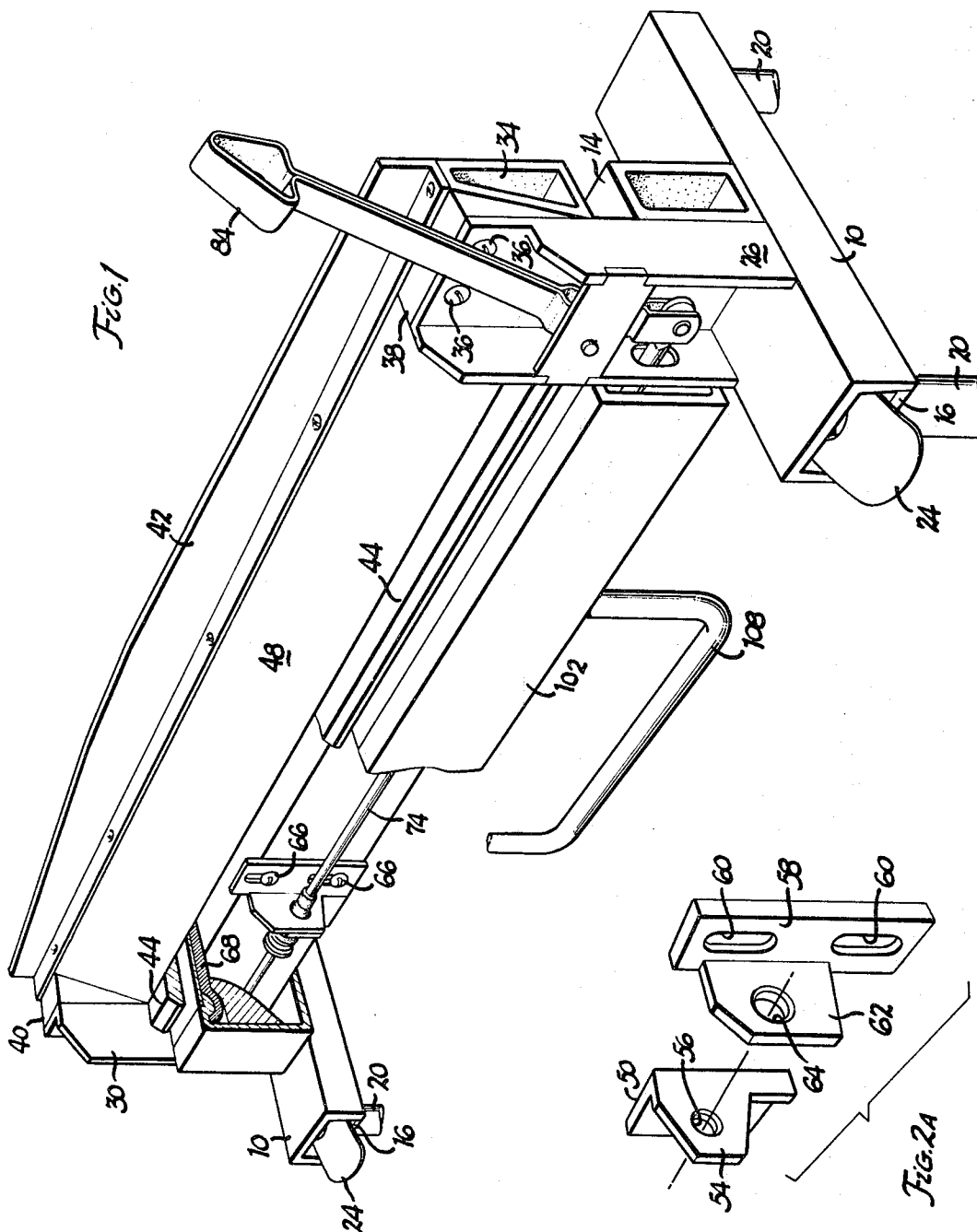
R. H. WISE

3,380,280

SHEET METAL BENDING BRAKE

Filed Sept. 16, 1965

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SHEET METAL BENDING BRAKE

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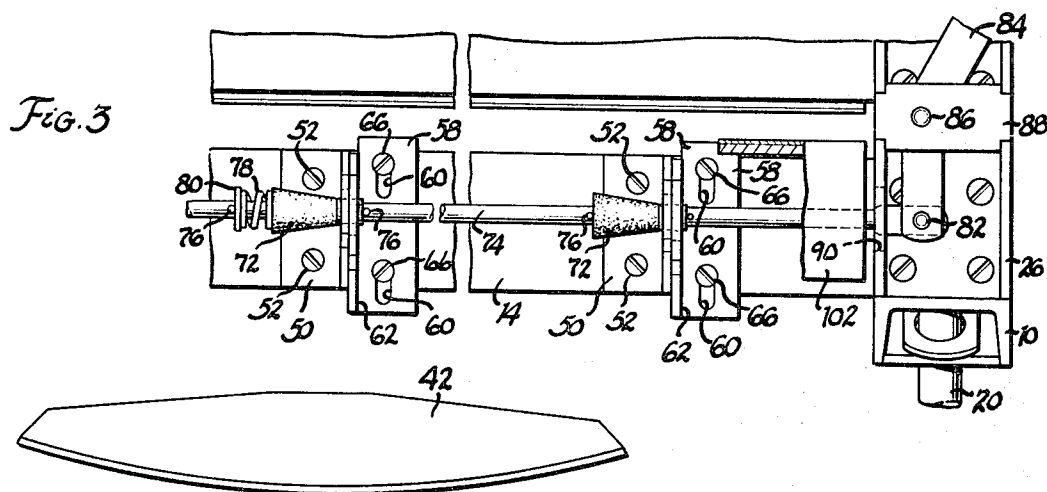
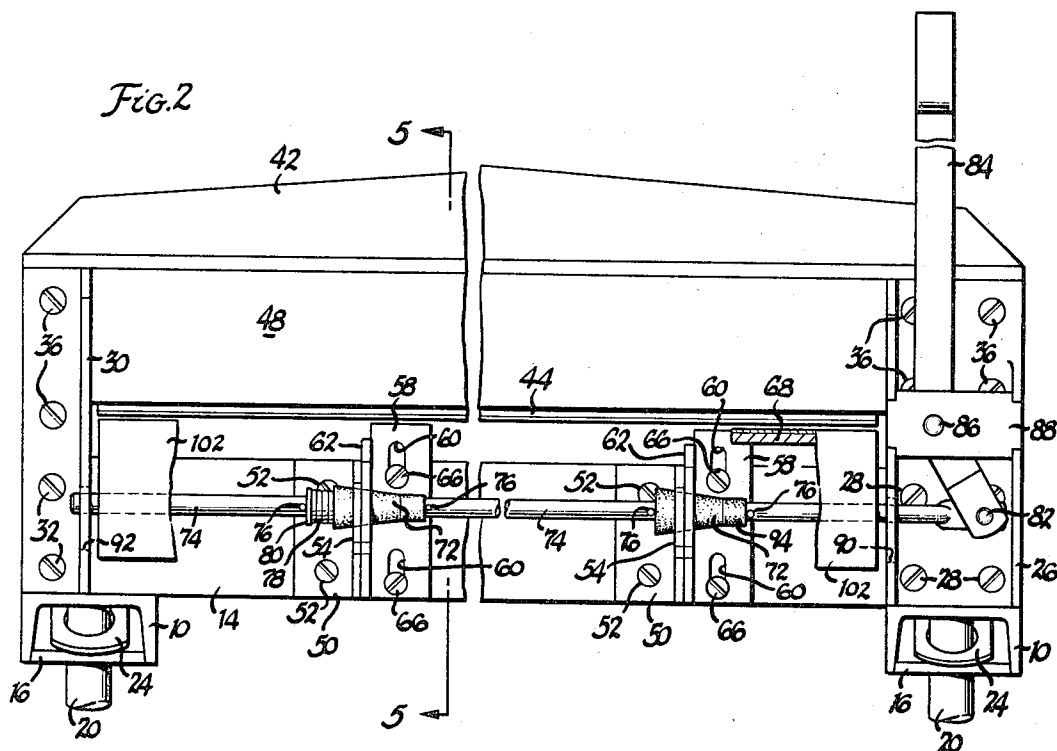


Fig. 6

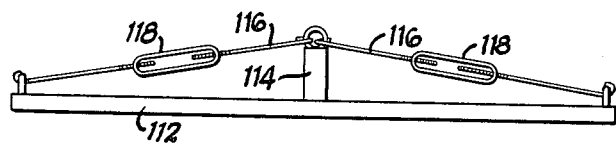
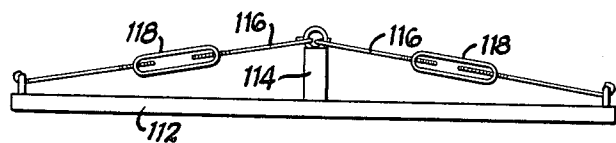


Fig. 7



Inventor:
RALPH H. WISE
By
WILSON, SETTLE, BATCHELDER
ATT'YS. & CRAIG

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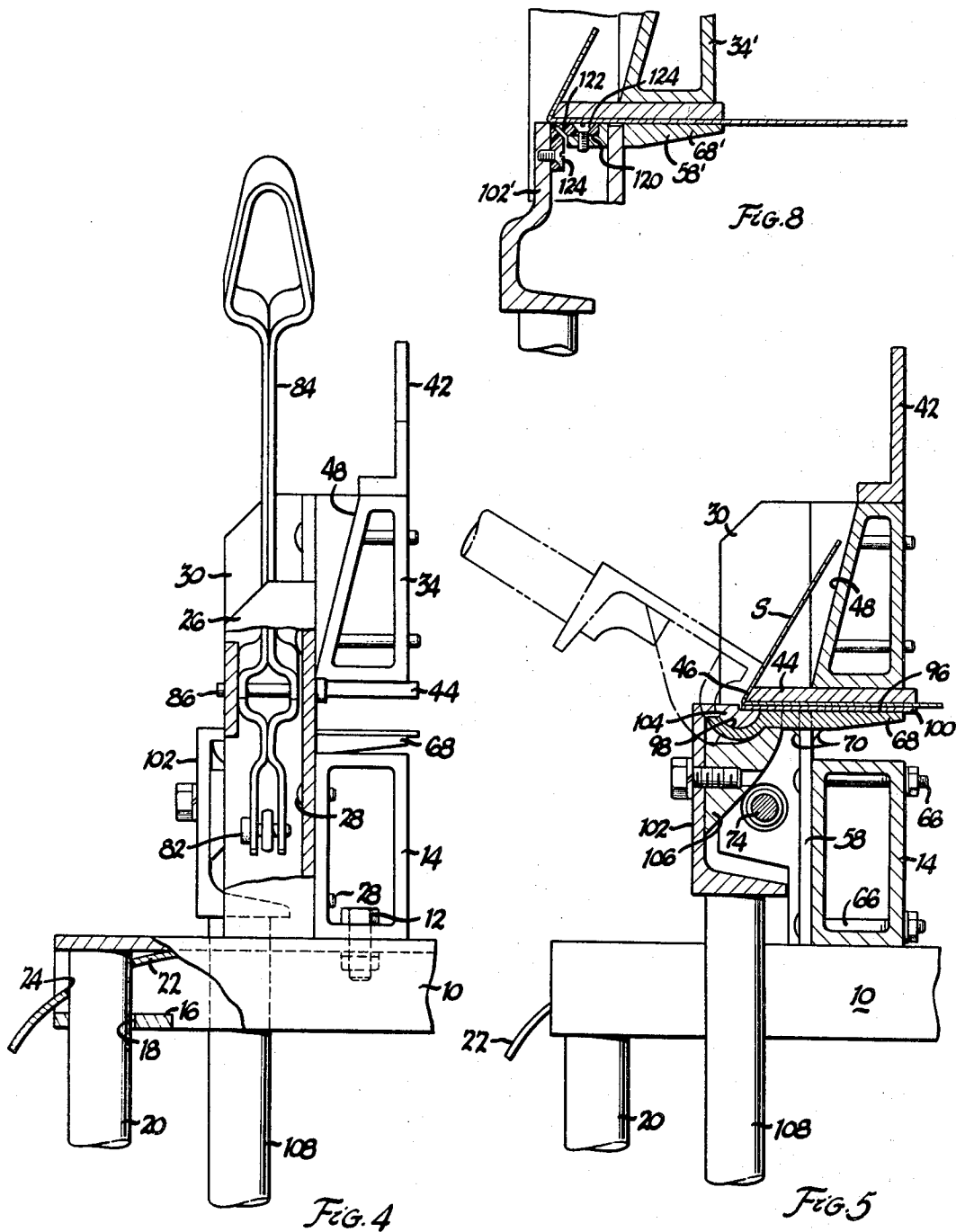
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SHEET METAL BENDING BRAKE

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Inventor.
RALPH H. WISE

By

WILSON, SETTLE, BATCHELDER
ATT'YS. & CRAIG

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SHEET METAL BENDING BRAKE

Ralph H. Wise, Columbus, Ind., assignor to Van-Mark Products Corporation, Detroit, Mich., a corporation of Michigan

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7 Claims. (Cl. 72-319)

ABSTRACT OF THE DISCLOSURE

The disclosure includes a brake for bending sheet metal material wherein parallel frame members are secured to a base in fixed and spaced apart relationship with a platen fixed to one frame member and an independent clamping table is movably secured to the other frame member and is arranged to be moved into and away from clamping relation with the platen.

This invention relates to brakes for bending sheet metal material, and more particularly to brakes of a portable type often used on the job by builders for bending or forming rain gutters, flashing, etc.

It is an object of the present invention to provide a sheet metal brake which can be readily fabricated from extruded sections and which presents a relatively large unobstructed opening for receiving sheet metal workpieces.

It is another object of the present invention to provide improvements in hinge constructions for sheet metal brakes. Still another object of the invention is to provide an improved clamping mechanism for sheet metal brakes.

Still another object of the invention is to provide a sheet metal brake having a relatively wide workpiece receiving opening in which a relatively light weight frame member is preloaded to possess substantial rigidity in use.

Other objects and features of the invention will become apparent by reference to the following specification and to the drawings.

In the drawings:

FIGURE 1 is a perspective view with certain parts broken away showing a sheet metal brake embodying the present invention;

FIGURE 2 is a front elevational view of the brake of FIGURE 1 with certain parts broken away or shown in section showing the brake in its closed position;

FIGURE 2a is a perspective view of the fixed and movable brackets;

FIGURE 3 is a front elevational view of a portion of the structure of FIGURE 2, showing the parts in the brake in open position;

FIGURE 4 is an end elevational view, with certain parts broken away or shown in section showing the brake in its open position;

FIGURE 5 is a detail cross sectional view taken along the line 5-5 of FIGURE 2;

FIGURE 6 is a detail view of the pre-stressed frame loading plate of the brake assembly of FIGURES 1 through 5;

FIGURE 7 is a detail view of another form of loading member adapted to be used in place of the member of FIGURE 6; and

FIGURE 8 is a detail cross sectional view of a modified form of hinge construction.

Referring first to FIGURES 1 through 5, the brake of the present invention has a fixed base which includes a pair of spaced channel-shaped base members 10 to which are fixedly secured as by bolts 12 (FIGURE 4) an elongate horizontally extending frame member 14 which, as best

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seen in FIGURES 4 and 5, is of hollow box-like transverse cross section. At each end of the channel-shaped base members 10, a leg mounting plate 16 is fixedly secured, as by welding, and bored as at 18 to receive the upper end of a detachable leg 20. Legs 20 are detachably retained upon base members 10 by means of a spring clip 22 fixedly secured to the inner surface of base 10 and have a bore 24 adapted to releasably grip the upper end of the legs 20. The brake of the present application has been specifically designed to be transported from job to job and the detachable legs make the transport of the brake more convenient.

A vertically extending channel-shaped frame member 26 is fixedly secured as by bolts 28 to project upwardly from the right hand base member 10 at the front side of horizontal frame member 14. An angle member 30 is similarly secured, as by bolts 32, to the front of horizontal frame member 14 to project upwardly from the upper side of the left hand base member 10. A second elongate horizontally extending frame member 34 of trapezoidal transverse cross section is secured to the upper ends of vertical frame members 26 and 30 by means of bolts 36, the bolts passing through wedge-shaped blocks 38 and 40 located between the vertically extending webs of members 26 and 30 and the inclined front face of frame member 34. A pre-loading member of generally L-shaped transverse cross section is bolted to the upper web of frame member 34 to preload this member 42 in a manner to be described in more detail below.

As best seen in FIGURE 5, a brake platen 44 having a braking edge 46 is fixedly secured, as by bolts, to the bottom web of upper horizontal frame member 34 and projects forwardly beyond the inclined front face 48 of frame member 34. The rearward and upward inclination of front face 48 combined with the forward projection of brake platen 44 enables the brake to bend sheet metal beyond a 90° angle.

Referring now particularly to FIGURES 2 and 3, a pair of fixed bracket elements 50 are formed from angle stock and are fixedly secured to the front of frame member 14 as by bolts 52 with one web 54 (FIGURE 2a) projecting normally forwardly from the front side of frame member 14 in a vertical plane. Web 54 is formed with a circular opening 56. In the embodiment shown in FIGURES 1 through 5, two stationary bracket members 50 are employed, one spaced inwardly from each of the two base members 10.

Adjacent each stationary bracket 50, a movable table lift bracket 58 is slideably mounted upon the front surface of frame member 14. Referring to FIGURE 2a, brackets 58 are formed with elongate slots 60 in their rearward web while the forwardly projecting web 62 is formed with a circular opening 64 of similar diameter as opening 56 in bracket 50. Brackets 58 are supported upon the front of frame member 14 by a pair of bolts 66 which pass freely through slots 60 and are fixedly secured to frame member 14. As best seen in FIGURES 2 and 3, in the assembled relationship, the forwardly projecting webs 62 of brackets 58 are in sliding face-to-face engagement with the forwardly projecting webs 54 of bracket members 50.

A clamping table element 68 is fixedly secured to the upper ends of brackets 58 as by weldments 70 (FIGURE 5). Table 68 is formed with slots into which the upper ends of brackets 58 project. Elongate slots 60 in brackets 58 support the brackets and table 68 for vertical movement relative to frame member 14 between the brake open or lowered position of FIGURES 1, 3 and 4 and the brake closed or clamping position of FIGURES 2 and 5. Table 68 is shifted between these positions by an actuating assembly which included a pair of frusto-conical actuating members 72 received within circular openings 56 and

64 of fixed brackets 50 and movable brackets 58 respectively. The manner in which the actuating mechanism shifts table 68 between its opened and closed position is best seen in FIGURES 2 and 3.

Both of actuating members 72 are identical and each member is formed with a central bore so that the member 72 can be slideably received upon an actuating rod 74. Transversely extending pins 76 hold the right hand actuating member 72 against movement axially upon the rod. The left hand actuating member 72 has its right hand end engaged with a pin 76 while its opposite or left hand end bears against a compression spring 78 which is seated between actuating member 72 and a washer 80 held axially upon rod 74 by a fourth pin 76. Spring 78 functions to allow some axial shifting of the left hand member 72 relative to actuating rod 74 to thereby decrease the degree of precision required in spacing members 72 upon the rod.

At its right hand end, actuating rod 74 is coupled as by pivot pin 82 to the lower end of an actuating lever 84. Lever 84 is pivotally mounted as at 86 between the central web of channel member 26 and a plate 88 fixedly extending between the two side webs of member 26. Rod 74 passes freely through elongate openings or slots 90 and 92 formed in the appropriate webs of channel member 26 and angle member 30.

Referring now specifically to FIGURE 2, the brake is shown with clamping table 68 in its elevated or clamping position. In this position, actuating lever 84 is located at its extreme limit of counterclockwise movement about its mounting pivot 86, thereby drawing rod 74 to its extreme right hand limit of movement. The frusto-conical actuating members 72 have thus been moved to a position where their large diameter end has been moved as far as possible into the circular openings 56 and 64 respectively of the fixed and movable brackets 50 and 58. The dimensions of the frusto-conical member are such that its large diameter end is of a diameter greater than that of openings 56 and 64, while its small diameter end is of a diameter substantially less than that of the openings 56 and 64. Preferably, a short cylindrical extension 94 projects axially from the small diameter end of each member 72.

In the position shown in FIGURE 2, openings 56 and 64 are forced, by the large diameter ends of frusto-conical member 72, into substantial coincidence with each other. The vertical location of openings 64 of movable brackets 58 is selected to be such that in the FIGURE 2 position, brackets 58 are elevated to the maximum extent permitted by elongate slots 60.

To lower table 68 to its open position, actuating member 84 is swung in a clockwise direction about its pivot 86, thereby shifting actuating rod 74 to the left from its FIGURE 2 position into its FIGURE 3 position. It should be noted that during this movement, the axis of the rod 74 moves downwardly to some extent.

The leftward movement of actuating rod 74 axially shifts the frusto-conical actuating members to the left, thereby aligning the small diameter end, or more correctly the cylindrical extension 94, of the actuating members within the circular openings 56 and 64. Rod 74 is supported against downward movement only by the engagement of actuating members 72 with the bottom portion of circular openings 56, and thus as the small diameter end of the actuating member is moved into openings 56, the rod moves downwardly so that the small diameter end of projections 94 rest upon the bottom portion of opening 56.

Table 68 in turn is gravitationally biased downwardly and is supported against downward movement solely by actuating members 72. Thus, as the small diameter end of actuating members 72 are axially positioned within opening 64, the upper portion of opening 64 rests upon the top of projections 94. This permits table 68 to lower from the FIGURE 2 to the FIGURE 3 position. When in the opening position, the circular openings 56 and 64 are not concentric with each other, the centers of openings 64 being located below the centers of openings 56 by a dis-

tance equal to the difference of the diameter of opening 56 (or 64) and the diameter of extension 94 of members 72.

Referring now particularly to FIGURE 5, table member 68 is conveniently constructed from an extrusion having the cross section shown in the view of FIGURE 5. This cross section includes a flat top surface 96 which terminates at one end at a groove 98 having a concave cylindrical surface. The radius of the surface of groove 98 is chosen and so located that when table 68 is in the closed position shown in FIGURE 5, the axis of the cylindrical surface of groove 98 is substantially co-extensive with braking edge 46 on platen 44. Preferably, stainless steel supporting surface 100 is fixedly mounted upon flat surface 96 of table 68 to minimize wear.

A brake bar 102 of an extruded generally channel-shaped cross section is formed with a ridge 104 which is complementary in shape to groove 98. Both groove 98 and ridge 104 of brake bar 102 extended for the entire length of table 68 and bar 102 respectively and thereby define a hinged mounting for bar 102 upon table 68, the axis of this hinge being substantially coincident with the braking edge 46 when the table is in its clamping position. To retain bar 102 upon table 68, a suitable number of retainer members such as 106 are detachably mounted upon the inner side of bar 102. A radially projecting handle 108 is mounted on bar 102 to assist in actuating movement of the brake bar. As is apparent from FIGURE 5, bar 102 is capable of pivoting movement from the full line position shown in FIGURE 5 to the dotted line position to thereby bend sheet metal S about braking edge 46 in a well known manner.

Referring now particularly to FIGURE 1, it will be noted that the brake described thus far is provided with a stationary braking platen of substantial longitudinal extent which is mounted upon the lower side of frame member 34, frame member 34 in turn being supported only adjacent its opposite ends. It is to be further noted that by the disclosed arrangement, the omission of C frames coupling frame members 14 and 34 provides an unobstructed opening between vertical frame members 26 and 30 of substantial width and unlimited depth. To further rigidify frame member 34 against bending forces occasioned during operation of the brake, the unsupported central portion of frame member 34 is preloaded by constructing loading member 42 with a preformed camber as best illustrated in FIGURE 6. When the curved member 42 is bolted to the flat upper surface of frame member 34, the original camber is straightened out, but in so doing, a downward force is exerted upon the unsupported central portion of member 34 to stiffen the central portion against bending during operation of the brake.

In FIGURE 7, a modified form of loading member is illustrated in which a beam 112 is suitably bored, not shown, so that beam 112 can be bolted to the upper surface of frame member 34. At one or more intermediate locations, compression members such as 114 are mounted and tension members 116 including turnbuckles 118 are coupled between tension member 114 and the ends of beam 112 as illustrated in FIGURE 7. By this method, the loading upon the unsupported central portion of frame member 34 can be varied at will. By increasing the number of compression members 14, varying degrees and configurations of preloading can be applied to member 34.

A modified form of hinge is disclosed in FIGURE 8.

In FIGURE 8, a modified table member extrusion 68' is formed with a simple right angle groove 120 at its forward end. Brake bar 102' of the FIGURE 8 embodiment is of a simple right angled web configuration and is mounted upon table member 68' by means of a one piece hinge 122 formed from a suitable thermoplastic material such as polypropylene. Hinge 122 is continuous over the entire length of brake bar 102' and

table 68' and is secured to the respective members by a suitable number of bolts such as 124.

While certain structural embodiments of the invention have been described in detail, it will be apparent to those skilled in the art that the disclosed embodiments may be modified. Therefore, the foregoing description is to be considered exemplary rather than limiting, and the true scope of the invention is that defined in the following claims.

I claim:

1. A sheet metal brake comprising a pair of stationary elongate rigid frame members, support means fixedly secured to said frame members adjacent each end thereof supporting said frame members in fixedly spaced parallel relationship with each other, an elongate brake platen fixedly secured to one of said frame members and having a longitudinally extending braking edge, an elongate clamping table mounted upon the other of said frame members and movable relative thereto for movement toward and away from said platen and said other of said frame members between a release position wherein said table is spaced from said platen and a braking position wherein said table is operable to clamp a piece of sheet metal to be bent against said platen, an elongate brake bar, and hinge means supporting said bar upon said table for pivotal movement about an axis substantially co-extensive with said braking edge when said table is in said braking position.

2. A brake as defined in claim 1 wherein said hinge means comprises a one piece hinge member of a thermoplastic material fixedly secured to said table and to said bar.

3. A sheet metal brake comprising a pair of elongate rigid frame members, support means fixedly secured to said frame members adjacent each end thereof supporting said frame members in fixedly spaced parallel relationship with each other, an elongate brake platen fixedly secured to one of said frame members and having a longitudinally extending braking edge, an elongate clamping table mounted upon the other of said frame members for movement toward and away from said platen between a release position wherein said table is spaced from said platen and a braking position wherein said table is operable to clamp a piece of sheet metal to be bent against said platen, means defining a groove in said table extending longitudinally of said table in parallel relationship to said braking edge, the wall of said groove defining a cylindrical surface having an axis substantially co-extensive with said braking edge when said table is in said braking position and an elongate brake bar having a longitudinally extending ridge thereon complementary in shape to said groove and slideably received therein to define a hinge supporting said bar upon said table for pivotal movement about an axis substantially co-extensive with said braking edge when said table is in said braking position.

4. A brake as defined in claim 3 wherein said table and said bar are extruded members with said groove and said ridge extending continuously over substantially the entire distance between said support means.

5. A brake as defined in claim 4 wherein said bar is of generally channel-shaped cross section having parallel upper and lower webs interconnected by a central web, said ridge being integrally formed on the lower side of said upper web, and retaining means for maintaining said ridge in seated engagement in said groove.

6. A sheet metal brake comprising a pair of stationary elongate rigid frame members, support means fixedly secured to said frame members only adjacent each end thereof supporting said frame members in fixed vertically spaced parallel relationship with each other, an elongate brake platen fixedly secured to the upper of said frame members and having a longitudinally extending braking edge, a loading member mounted upon said upper of said frame members for applying a downward action load upon the unsupported central portion of said upper of said frame members, an elongate clamping table mounted upon the other of said frame members and movable relative thereto for movement toward and away from said platen and said other of said frame members between a release position wherein said table is spaced from said platen and a braking position wherein said table is operable to clamp a piece of sheet metal to be bent against said platen, an elongate brake bar mounted upon said table for pivotal movement about an axis substantially co-extensive with said braking edge when said table is in said braking position.

7. A sheet metal brake comprising a pair of stationary elongated frame members, support means rigidly securing said frame members in fixed spaced apart parallel relationship with each other, an elongated brake platen rigidly secured to one of said frame members and having a longitudinally extending braking edge, an elongated clamping table, mounting means for movably securing said table on the other of said frame members for movement relative to said frame members, means for moving said mounting means and table toward said platen wherein said table is operable to clamp a piece of sheet metal to be bent against said platen, an elongated brake bar, and hinge means supporting said bar upon said table for pivotal movement about an axis substantially co-extensive with said braking edge when said table is in said braking position.

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RICHARD J. HERBST, *Primary Examiner*.

E. SUTTON, *Assistant Examiner*.