

[54] SEAMING TOOL

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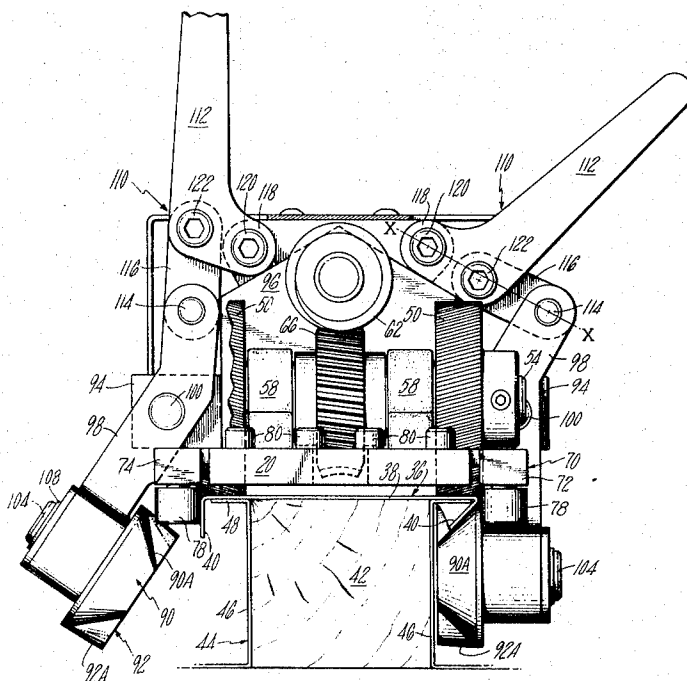
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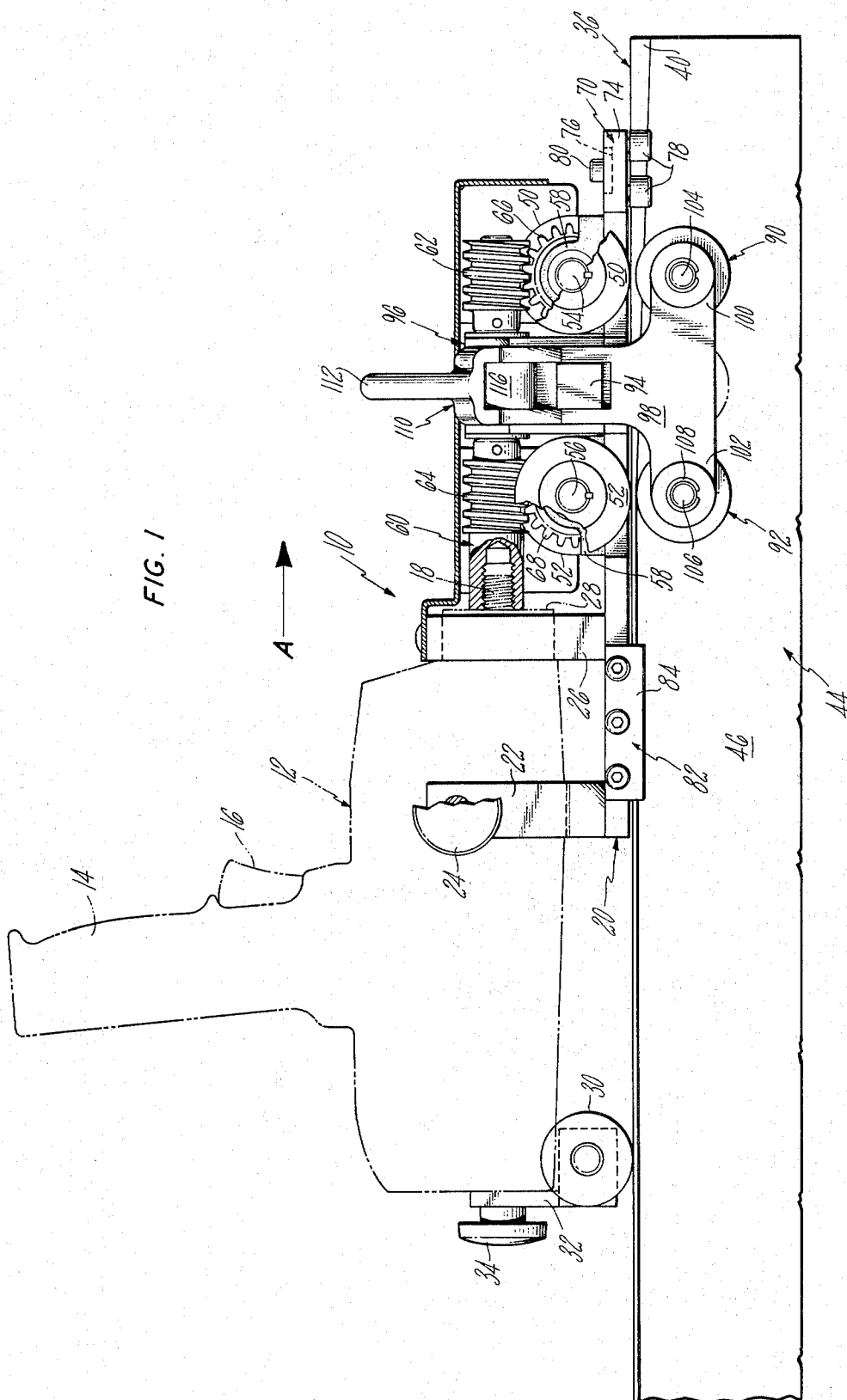
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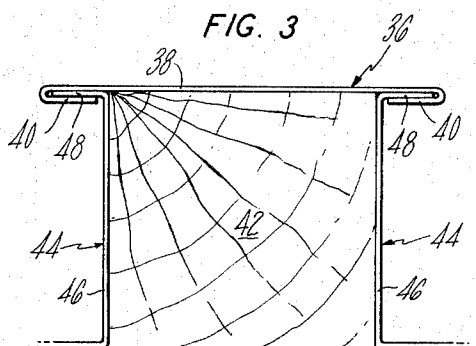
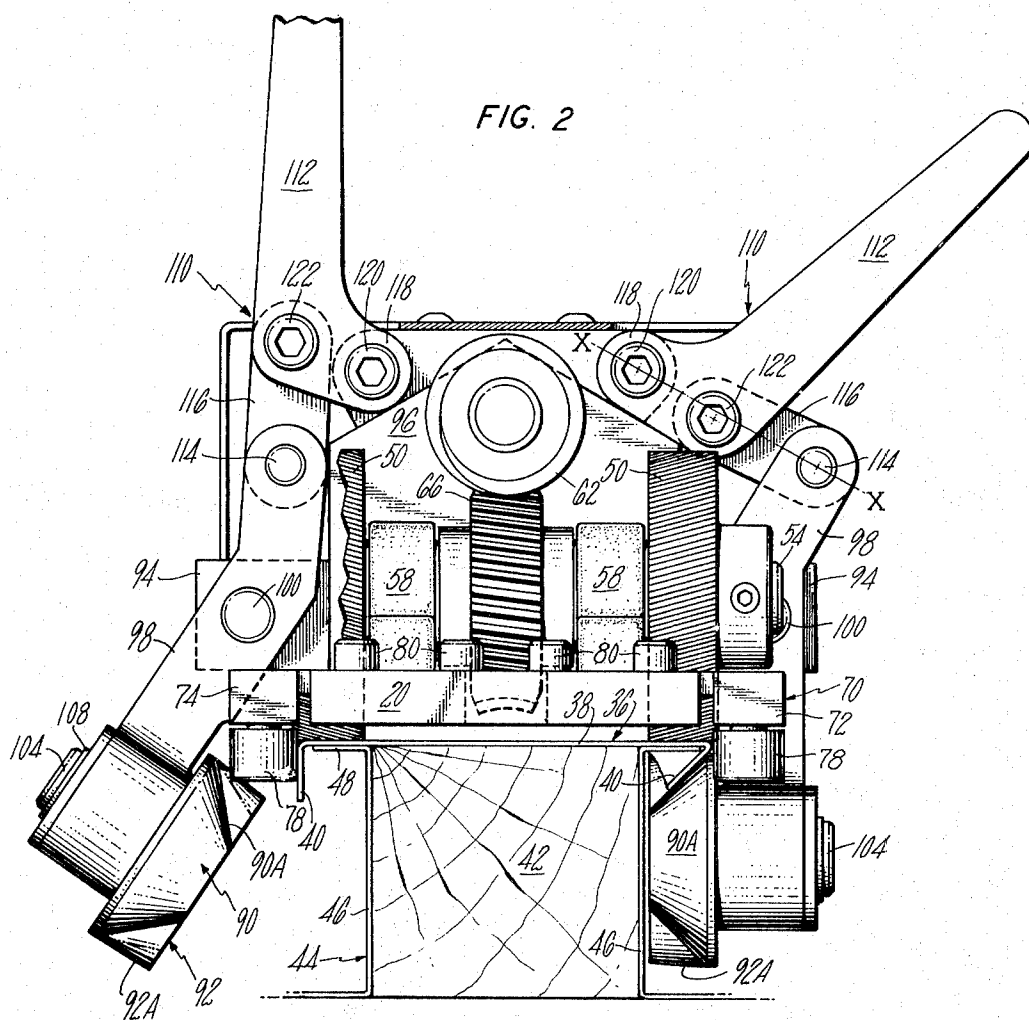
[57] ABSTRACT

A pair of rollers are arranged in tandem below a frame movable along a piece of sheet material for progressively bending an elongated flanged edge of the sheet material into interlocking folded relation to an underlying sheet member. The rollers are pivotally supported on the frame for swinging movement toward and away from the frame between an operative position, wherein the rollers are disposed for a sheet bending operation, and a retracted rest position.

7 Claims, 3 Drawing Figures







SEAMING TOOL

This invention generally relates to sheet material forming tools and particularly concerns a portable sheet material seaming tool.

A primary object of this invention is to provide a new and improved tool for joining lapping edge portions of sheet material into interlocking folded relation.

Another object of this invention is to provide a new and improved tool particularly useful in the construction of sheet metal roofing for assembling a sheet metal cap onto an underlying strip of sheet metal.

A further object of this invention is to provide a new and improved tool quick and easy to manufacture and assemble and which significantly simplifies the forming of joints between a pair of sheet material pieces.

Still another object of this invention is to provide a new and improved tool quick and easy to use for automatically forming folded, uniform joints along adjacent edges of a pair of elongated pieces of sheet material.

Other objects will be in part obvious and in part pointed out in more detail hereinafter.

A better understanding of the objects, advantages, features, properties and relationships of the invention will be obtained from the following detailed description and accompanying drawings which set forth an illustrative embodiment is indicative of the way in which the principle of this invention is employed.

In the drawings:

FIG. 1 is a side view, partly broken away and partly in section, showing a tool, incorporating this invention, in operative position for joining two pieces of sheet material;

FIG. 2 is an enlarged front end view of the tool of FIG. 1, partly broken away and partly in section; and

FIG. 3 is an assembled view of a typical sheet metal roof construction of a type with which the tool of this invention is particularly useful.

Referring to the drawings in detail, a tool 10 is shown incorporating a preferred embodiment of this invention. While the tool 10 is illustrated and described for purposes of explanation in conjunction with the installation of sheet metal roofing components, it will be understood that tool 10 is equally useful in a variety of different applications wherein a pair of elongated pieces of sheet material are to be joined in overlapping relation along adjacent edge portions.

In the specifically illustrated embodiment, it will be understood that a rotary electrical motor is received in a housing of a power unit 12 with an upwardly projecting handle 14 for manipulating tool 10. Handle 14 is shown having a conventional on/off switch 16 for connecting the motor to a source of electrical power, not shown, for energizing the motor and rotating a rotary drive output member 18.

Tool 10 is provided with a frame 20 having a U-shaped supporting mount 22 adapted to be secured, e.g., by a pair of releasable locking screws (one shown at 24) to the power unit 12, and a front mounting support 26 which will be understood to have an opening formed therein for embracing a reduced front portion 28 of the power unit 12. Its rear portion is supported for rolling movement on a pair of supporting wheels (only one shown at 30) mounted for rotation on an end mounting bracket 32 secured to a rear end portion of the power unit 12 by a releasable locking screw 34.

The frame 20 is preferably of a width slightly less than the underlying structure along which the tool 10 is to be driven to effect an automatic seaming operation. As best illustrated in FIG. 2, tool 10 is shown applied to a cap 36 formed of a strip of sheet material of generally uniform thickness such as sheet metal having an inverted U-shaped cross section with an elongated web 38 and longitudinally extending flanged edges as at 40 integrally formed on opposite sides of the cap 36. The cap 36 may be placed on a structure which, e.g., includes an underlying timber beam 42 and adjacent side beam enclosures 44, 44 (which also may be formed of sheet metal) and which, in conjunction with the cap 36, cover the beam 42. The side enclosures 44, 44 each are shown having an upright wall portion 46, 46 which will be understood to extend in a direction along the length of the beam 42 and which provides an elongated sheet member of generally uniform thickness or shoulder 48, with shoulders 48, 48 being integral with wall portions 46, 46 and projecting in opposite lateral directions away from the beam 42.

Cap 36 accordingly may serve as a supporting surface for tool 10, the movement of which is effected along the exposed upper planar web 38 upon positioning cap 36 with its flanged edges 40, 40 overlapping the unsupported underlying shoulders 48, 48. For this purpose, front and rear pairs of drive wheels 50 and 52 (FIG. 1) are secured to drive shafts 54 and 56 supported in suitable pillow-block bearings fixed on frame 20 as at 58, such that the drive wheels 50 and 52 are engageable with the side edge portions of the cap 36 overlying shoulders 48, 48 (FIG. 2). A driving connection between the rotary drive output member 18 of the power unit 12 and the drive wheels 50, 52 is effected by a worm drive shaft 60 coupled, preferably by a suitable threaded connection to drive output member 18, and carrying worms 62 and 64 in meshing engagement respectively with worm gears 66 and 68 which are secured to drive shafts 54 and 56 upon which their respective drive wheels 50 and 52 are fixed for rotation in response to energization of the power unit 12.

To minimize any undesired side-to-side swinging or skewing movements of tool 10 relative to its axis of movement along the length of the beam 42, front and rear tool guide attachments are provided in the preferred embodiment. Front guide attachment 70 is provided with laterally projecting guide members 72 and 74 supported for sliding movement within a guideway 76 formed in a front portion of the frame 20, and a pair of rollers 78, 78 will be understood to be supported on vertical depending shafts on each of the guide members 72, 74, whereby the rollers 78, 78 on each side of the frame 20 may be suitably adjusted and secured to the frame by suitable releasable fasteners 80 for varying widths of caps such as 36 which are to be assembled. Rear guide attachments such as shown at 82 will be understood to be of similar construction and mounted on opposite lateral sides of the frame 20 rearwardly of the rear drive wheels 52 and under a forward part of the power unit 12. Each rear guide attachment (FIG. 1) is provided with a depending side rail or plate such as at 84 which will be understood to be laterally adjustable to a desired position relative to the frame 20 and width of the cap 36 by any suitable means to minimize skewing of tool 10 upon driving it down the length of the beam 42 to be enclosed with the sheet metal parts.

To automatically seal and lock cap 36 in a uniformly extending seam along both upper side edges of the beam 42, a pair of sheet bending rollers 90 and 92 are mounted in tandem below each side of the frame 20 for rotation about parallel axes and provide independently operable crimping units on opposite sides of the tool 10 for successively bending the flanged edges 40, 40 on both sides of cap 36 into a fold along the underlying longitudinally extending shoulders 48, 48. Since each of the crimping units are substantially the same, although mounted in reverse relation on opposite sides of the tool 10, the same numbers will be used to identify like crimping unit parts in the drawings.

Extending in opposite directions laterally outwardly of the frame 20 between pillowblock bearings 58 of the drive wheels 50 and 52 are projections 94, 94 integrally formed on a worm drive supporting frame 96. Projections 94, 94 are each disposed in outboard relation to the tool frame 20, and control or rocker links 98, 98 are respectively supported on opposite sides of frame 20 for swinging movements about pivot pins 100, 100 fixed to supporting frame projections 94, 94 with the axes of the pivot pins 100, 100 extending in parallel relation to the axis of movement of tool 10. Each rocker link 98 is shown in the preferred embodiment as having front and rear extensions 100, 102 (FIG. 1) on a lower end portion of the link on which shafts 104 and 106 are mounted for rotatably supporting front and rear sheet bending rollers 90, 92. Shafts 104 and 106 are suitably secured, e.g., by restraining rings 108 with the axes of the rollers 90 and 92 in the preferred embodiment being contained in a common plane with the rotational axes of their overlying drive wheels 50 and 52.

For selectively positioning the respective crimping units between a retracted rest position, as viewed at the left hand side of tool 10 in FIG. 2, and an operative position, as viewed at the right hand side of tool 10 in FIG. 2, a control mechanism 110 is provided for each crimping unit for simultaneously pivoting the rollers 90, 92 on each rocker link 98 responsive to actuation of a handle lever 112. More specifically, the rocker link 98 of each crimping unit has an upper offset arm extending above its respective pivot pin 100 with the offset arm of each rocker link 98 pivotally connected by a suitable pivot pin 114 to one end of a toggle link 116 having its opposite end pivotally connected to its respective handle 112. Each handle 112 has an offset lever portion 118 pivotally connected by a pivot pin 120 mounted on the worm drive supporting frame 96.

To operate tool 10, each of its crimping units is retracted into rest position by moving handles 112 into an upright position. The front and rear tool guide attachments 70 and 82 are then adjusted to match the width of the sheet metal cap 36 to be seamed, and tool 10 is manually positioned in a starting position at one end of the beam 42. While cap 36 at the starting end of the beam 42 may be manually crimped to facilitate initiation of the seaming operation, the control mechanism 110 for each crimping unit may be simply actuated by moving the handles 112 downwardly into position as viewed at the right hand side of FIG. 2, thereby moving the toggle linkage into latched position and pressing rollers 90, 92 into operative position whereupon drive wheels 50 and 52 may be power operated upon energizing power unit 12.

By virtue of the disclosed toggle linkage of the control mechanism 110 for each crimping unit, when each

handle 112 is moved downwardly, a knee pin 122, pivotally connecting each handle 112 to its toggle link 116, is moved overcenter of its line of action X—X between toggle pivot pins 114 and 120. Such construction ensures that rollers 90, 92 will be latched in operative position, virtually eliminating any possibility of inadvertent release of rollers 90, 92 since any force acting on rollers 90, 92 to urge them laterally outwardly from frame 20 and their operative position adjacent the beam enclosure 44, tends to further latch the toggle linkage.

In accordance with still another aspect of this invention, the leading sheet bending roller 90 of each crimping unit is tapered in a direction away from the fold to be effected on cap 36 and is contoured with a truncated cone configuration having a pronounced taper to provide a working surface 90A inclined to its rotational axis at an angle significantly greater than the angle of the working surface 92A of the trailing roller 92 which, as best seen in FIG. 2, is preferably provided with a slight taper in a direction away from the fold. By such construction, the flanged edges 40 of cap 36 are progressively bent in succession by the rollers 90 and 92 as tool 10 is driven along the length of beam 42 in the direction of arrow A. Accordingly, the leading rollers 90, 90 bend the depending flanges 40, 40 approximately 45° from their initial vertical position as seen at the left hand side of FIG. 2 into the position shown at the right hand side of FIG. 2. Thereafter, the trailing or finishing rollers 92, 92 effect a firm uniform rolling pressure against the exposed outer flange surface, and with the cooperation of the overlying drive wheels 52, 52, effect a final bend of about an additional 45° to the flanged edges 40, 40 to move them into interlocking relation to the shoulders 48, 48 of the underlying beam enclosures 44, 44 and effect uniform, smoothly folded contoured seams along the longitudinally extending upper edges of the beam 42.

A tool constructed in accordance with the above disclosure will provide a useful device which is quick and easy to manufacture and assemble and which significantly simplifies the sealing and locking of pieces of sheet material which heretofore has been laboriously manually crimped, while yet achieving significantly improved seams with minimal camber or deviation of the unsupported side edges of the sheet material enclosures relative to a projected line parallel to the axis of the beam. It will be appreciated that the tool may be used with different sheet materials and with linear or smoothly contoured curvilinear parts to be enclosed. The close and accurate fold which is achieved by the tool of this invention may be obtained repeatedly under demanding conditions and these advantages are exhibited in the tool which is quick and easy to use, relatively compact and has few service requirements.

As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the teachings of the present invention.

I claim:

1. A tool for simultaneously seaming opposite longitudinally extending flanged edges of elongate sheet material along an underlying sheet member and comprising a frame movable along the surface of the sheet material, first and second pairs of sheet bending rollers respectively mounted on opposite sides of the frame, each pair of sheet bending rollers being supported in

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tandem on its respective side of the frame for rotation about parallel axes normal to the path of movement of the frame for bending their respective flanged edge of the sheet material and progressively forming a lapping fold thereof about the underlying sheet member, each pair of rollers being pivotally supported for swinging movement on the frame about a pivotal axis parallel to the path of movement of the frame for selective positioning of the rollers in an operative position and a rest position in retracted relation to the frame, first guide means engageable with the flanged edges on opposite sides of the sheet material and mounted on the frame in forwardly disposed relation to the sheet bending rollers for guiding a leading end of the tool, and second guide means mounted in following relation to the sheet bending rollers for engagement with the flanged edges on opposite sides of the sheet material to minimize any undesired skewing movement of the tool about an axis perpendicular to the tool supporting surface of the sheet material.

2. The tool of claim 1 wherein a control link is provided for each pair of sheet bending rollers, the control links each being mounted on the frame for swinging movement about said pivotal axis, each pair of rollers being supported for rotation on their respective control link, and the control links each being manually operable for simultaneously pivoting its respective pair of rollers between said operative position, wherein the rollers are at least in part positioned in underlying relation to the frame, and said retracted rest position, wherein the rollers are in offset relation to the frame.

3. The tool of claim 2 wherein each control link is movable into a releasable latched position upon movement of its rollers into said operative position.

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4. The tool of claim 1 wherein a control link is provided for each pair of rollers and is mounted on the frame for swinging movement about said pivotal axis, each pair of rollers being supported for rotation on their respective control link, and wherein manually operable over-center toggle linkage is drivingly connected to each control link for selectively moving its rollers and latching and unlatching their respective control link and its rollers upon moving the rollers respectively into and away from said operative position.

5. The tool of claim 1 wherein each pair of rollers include a leading roller having a truncated cone configuration with a tapered working surface inclined at an angle relative to its rotational axis for making a first bend in their respective flanged edge of sheet material, and a trailing roller having a working surface which is inclined to its rotational axis at an angle less than that of the leading roller for making a further bend in their respective flanged edge of sheet material for progressively forming the lapping fold.

6. The tool of claim 1 further including drive means for propelling the frame, and power operating means carried by the frame for operating the drive means.

7. The tool of claim 1 further including a pair of power operated rotary friction wheels mounted on each side of the frame and engageable with the tool supporting surface of the sheet material for driving the frame along its surface with each pair of friction wheels mounted on its respective side of the frame in overlying opposed relation to the sheet bending rollers when they are in an operative position for a sheet material bending operation.

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