April 14, 1942. H. A. BERLINER ET AL 2,279,965

METAL FORMING MACHINE

Filed March 30, 1939

Fig. 1.

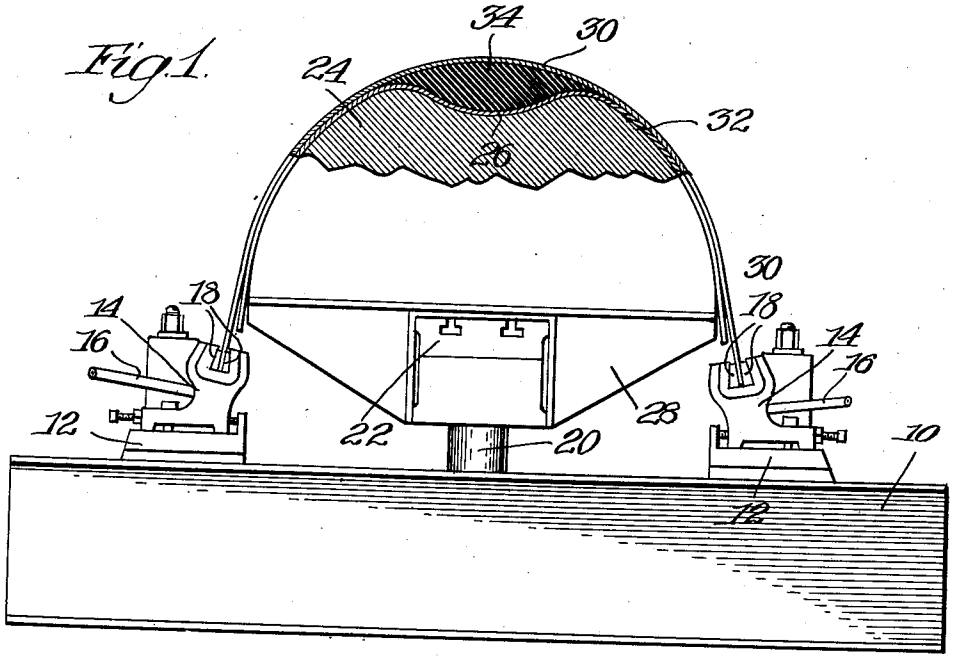


Fig. 2.

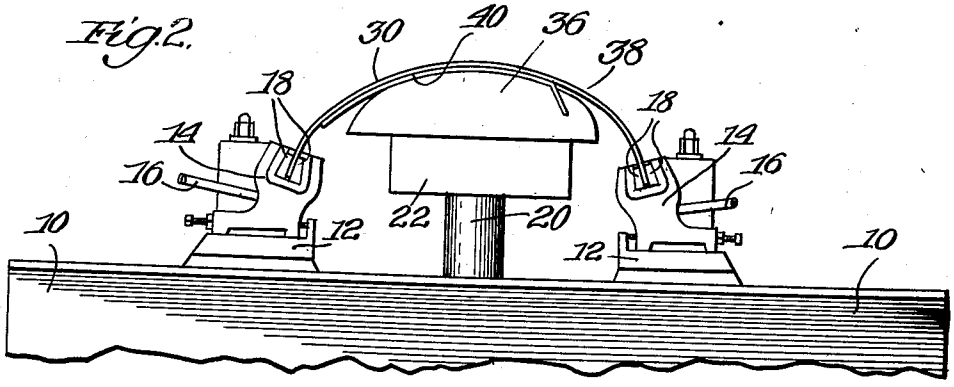
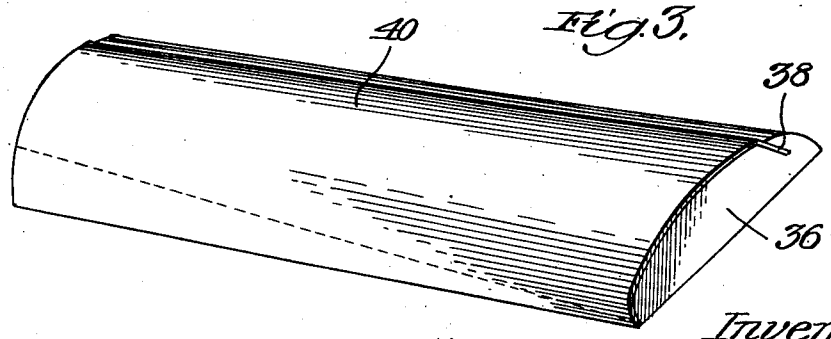


Fig. 3.



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METAL FORMING MACHINE

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3 Claims. (Cl. 153—32)

This invention relates to metal forming machines and more particularly to the formation of sheet metal into various shapes.

In forming metal sheets, and particularly where a relatively small number of any given shape is desired, presses have been employed in which the edges of a sheet are clamped and a form is pressed into the sheet to stretch and form it into the desired shape. One such press is disclosed in the copending application of Henry A. Berliner Serial No. 233,726 filed October 7, 1938.

With presses of this type forms must be employed which are entirely convex and no concave shape is possible except in a line transverse to the line between the clamps. Difficulty may also be encountered with forms having convex portions and straight portions or portions of varying convex curvature in getting the metal to shape itself closely to the form.

It is accordingly one of the objects of the invention to provide a machine and a method for forming metal sheets into shapes including portions of different convex curvature, one or more of which portions may be concave. According to one important feature this is accomplished by providing an outer working sheet over the form with the sheet to be formed lying between the form and the working sheet. A mass of rubber or other gum or plastic material may be placed between the sheets at the point or points where a concave or relatively concave curvature is to be produced to press the inner sheet closely against the form.

In machines of this type it has been the usual practice to clamp the sheet to be formed and then press the form into it. This necessitates a considerable amount of trimming which may, in the case of some of the more expensive sheet materials, result in a serious waste problem.

It is accordingly another object of the invention to provide a forming machine and method in which trimming is minimized or entirely eliminated. This may be accomplished by using a working sheet which presses the sheet to be formed against the form. In this way the sheet to be formed need not be clamped and may be made smaller so as to reduce or eliminate trimming.

Still another object of the invention is to provide a forming machine and method in which the sheet to be formed is frictionally held in place on the form. This is preferably accomplished by providing a depressed or cut out portion in the pattern to receive a portion of the sheet and hold it against slipping. According to one important feature this cut out portion may be in the form of an elongated slot to receive the edge of the sheet so as to anchor the sheet along said edge and to form an angular flange thereon.

Other objects, advantages and novel features of the invention will be apparent from the following description of the embodiments illustrated in the accompanying drawing, in which:

Figure 1 is a partial side view with parts in section of a machine embodying the invention;

Figure 2 is a similar view showing the machine with a different form or pattern thereon; and

Figure 3 is a perspective view of the sheet and pattern of Figure 2.

The illustrated machine includes a pair of elongated spaced beams 10 having cross beams 12 slidably mounted thereon. Each of the beams 12 carries a plurality of clamps 14 individually adjustably secured thereto, which clamps may be operated by fluid under pressure admitted through pipes 16 as is more fully described and claimed in said copending application Serial No. 233,726. Each clamp includes a pair of jaws 18 adapted to grip the edge of a sheet of metal or the like.

Between the beams 12 there is arranged a plunger 20 adapted to be moved upwardly under hydraulic pressure or the like. The plunger has a head 22 for supporting a form or pattern of the desired shape.

As shown in Figure 1 a form 24 of generally convex shape in a line between the clamps and having a concave portion 26 is supported on a beam or platform 28 which is secured to the head 22. It will be understood that the transverse section of the form may be of any desired shape and will generally be in the form of a curve such that a double curvature is presented.

According to the present invention a working sheet 30 which may be of steel or any other strong but relatively flexible material is clamped at its ends in the jaws 18 and extends across the form. A sheet 32 to be formed and which may be steel, aluminum or any other desired metal or alloy is placed over the form under the working sheet 30. The sheet 32 may have its ends clamped in the jaws 18 with the sheet 30 or may be secured by separate additional clamps but is preferably laid loosely over the form with its ends free as shown.

In order to press the sheet 32 into the concave portion 26 of the form, a block of yieldable material 34, shown as rubber, is arranged between the sheets 30 and 32. This block may be loose

or may be cemented or otherwise secured to the sheet 30, as desired.

When the plunger 20 is raised, it presses the sheet 32 into the sheet 30 and against the block 34 so that the sheet 32 is pressed closely against the form or pattern 24 and is shaped to conform thereto the metal of he work sheet being caused to flow between the pattern and the sheet 30 to conform to the double curvature of the pattern during this operation. The use of a yieldable block eliminates the necessity for accurate formation thereof while insuring that the sheet will be pressed closely against the form. Pressing of the sheet into the cut-out concave portion 26 also anchors the sheet against slipping on the form as it shaped.

Figure 2 illustrates the machine of Figure 1 with a different form or pattern thereon. As shown, a curved tapered pattern 36 such as might be employed in forming edge strips for an airplane wing is secured to the head 22. An elongated narrow groove 38 is formed in the pattern 36 adjacent one edge thereof to receive one edge of a sheet 40 to be formed.

In operating this embodiment the edge of a sheet 40 is inserted in the groove 38 and the sheet may, if desired, be bent over slightly toward the surface of the pattern 36. The plunger 20 may then be raised to press the form and the sheet 40 into the working sheet 30 so that the sheet 40 will be pressed closely around the form. The pressure of the working sheet on the sheet 40 adjacent the groove 38 locks the sheet 40 on the form to prevent slipping thereof and the portion of sheet 40 extending into the groove 38 may be trimmed off or may be retained as a fastening flange.

It will be understood that the forming sheets 30 may be used a number of times without replacement. Also by cutting the sheets to be formed to the correct initial shape all trimming may be avoided but in any event trimming will be very much reduced.

It will further be understood that the drawing and above description are illustrative only and are not intended as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. A sheet metal forming machine comprising a movable head adapted to have a form attached thereto, a flexible, non-resilient forming sheet having its edges fixedly secured on opposite sides of the head and having its central portion disposed in the path of the head and arranged in the approximate shape of the form, and means for moving the head and form toward the forming sheet whereby a work sheet positioned between the form and the forming sheet and which is to have the shape of the form is deformed between the form and the central part of the forming sheet.

2. A sheet metal forming machine according to claim 1, in which the form is provided with a slot within which an edge of the work sheet is adopted to be received.

3. A sheet metal forming machine according to claim 1 in which a form having a concave portion and a convex portion is attached to the movable head, and in which a mass of yieldable material is disposed interiorly of the forming sheet at the part thereof adjacent the concave portion of the form, whereby a work sheet positioned between the forming sheet and the form will be forced into the concave portion of the form by the mass of yieldable material.

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