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A. J. MOORE

2,829,546

SHEET METAL FORMING MACHINE

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Fig. 1

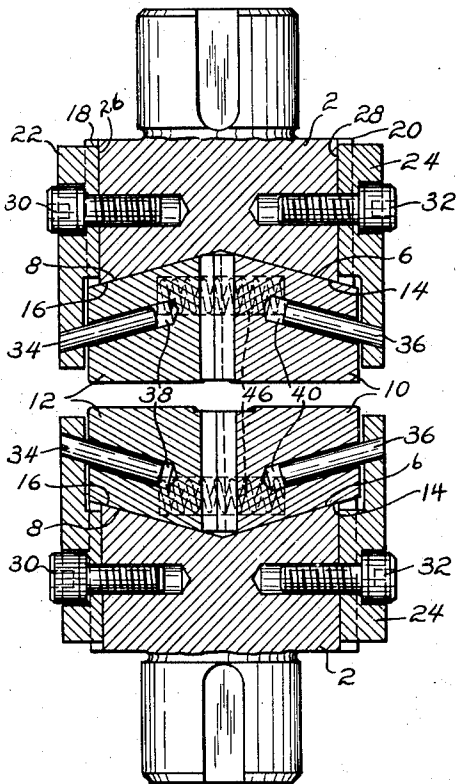


Fig. 2

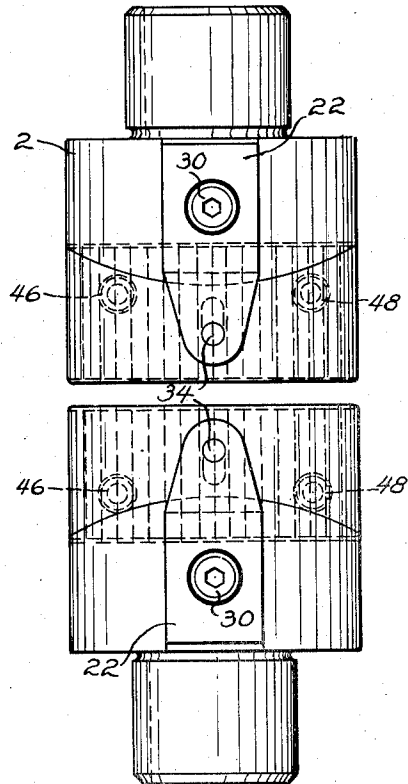
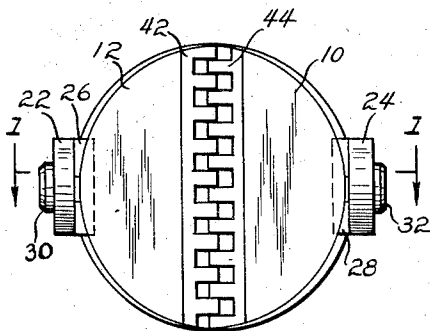


Fig. 3

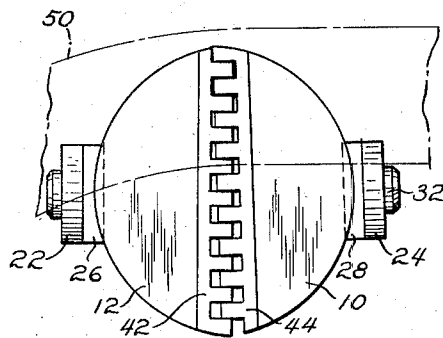


Fig. 4

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SHEET METAL FORMING MACHINE

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2 Claims. (Cl. 78—61)

The present invention relates to sheet metal forming machines and more particularly to an arrangement of jaws used with such machines for shrinking or stretching metal.

One of the objects of the present invention is to provide a metal forming machine including metal engaging jaws which will permit greater control of the amount of deformation of the metal than is presently obtainable.

Another object of the invention is to provide a pair of jaws for a sheet metal shrinking or stretching machine which will permit the degree of friction to be progressively varied as the metal approaches the center of the jaws.

A further object of the invention is to provide a pair of jaws which will permit deformation of delicate metals without marring the face of the work.

Other objects and features of novelty will be apparent from the following description of the invention disclosed in the accompanying drawing, in which:

Fig. 1 is an axial view of a pair of jaws, partly in section;

Fig. 2 is a side view of a pair of jaws;

Fig. 3 is an end view of one jaw, in inoperative position, and

Fig. 4 is an end view of one jaw in operative position.

Referring to the drawing, the novel jaw assembly for the shrinking or stretching machine comprises two identical supporting members 2, circular in cross-section, adapted to be moved toward and away from each other by means of any suitable machine, not shown. As each supporting member and its related parts are identical, for the purposes of clarity, only one member will be described in detail. Opposed faces of the supporting members are provided with cam surfaces 6, 8 which converge inwardly from opposite sides of each supporting member. Each cam surface is adapted to support one of a pair of jaw members 10, 12. Each jaw member of the pair is provided with a cam surface 14, 16 which corresponds in angularity to the cam surfaces 6, 8 of the supporting members.

The jaw members are supported on the cam surfaces by means which will now be described. Slots 18, 20 are provided in opposite side walls of the supporting members and receive retainer plates 22, 24, said retainer plates being provided with shoulders 26, 28 adapted to fit into the slots to prevent sideward movement thereof. The plates 22, 24 are attached to the supporting members by suitable means, such as bolts 30, 32. Mounted on the free end of each plate 22, 24 is a jaw retainer pin 34, 36 which is adapted to be received in an opening 38, 40 in each jaw, the pins 34, 36 being disposed at an angle corresponding to the angularity of the cam surface. It should be particularly noted that the openings 38, 40 are slightly larger than the retainer pin received therein, the purpose of which will be more fully explained hereinafter. Each jaw, which is semi-circular in cross-section, is provided on its flat side face with vertical tooth like members 42, 44, the members 42 of one jaw interfitting the corresponding members 44 formed on the complementary jaw,

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as illustrated in Fig. 3. The apertures formed between adjacent teeth in the complementary jaws are slightly larger than the teeth which are adapted to be projected therein.

5 Means are provided for maintaining the jaws in a separated condition, such means comprising springs 46, 48 which are received in suitable openings formed in the inner side walls of the complementary jaws.

10 The upper surface of each jaw adjacent teeth 42, 44 may be slightly bevelled, as seen in Fig. 1, to receive the metal as it expands during the shrinking operation.

The amount of shrinkage or stretching is determined by the position of the metal on the jaws, the greater the distance toward the center, the greater the amount of upsetting of the metal. To achieve the desired amount of deformation, the jaws are so mounted that when sufficient pressure is applied to them and the work therebetween, the complementary jaws first move toward each other in a straight line and then, with added pressure, the jaws of a pair become angularly displaced and the metal is deformed. This angular displacement is obtainable because of the space between interfitting teeth and the loose fit between the retainer pins and jaws carried thereon.

25 The two jaw pairs are mounted for angular movement in the respective members 2 by their respective pins 34 and 36; and springs 46 and 48 normally urge the jaw pairs apart whereby they engage at their rearward portions against retainer plates 22 and 24 in the position generally shown in Figure 1. The angular or rotational movement of the jaws in a plane parallel to their faces may be understood by viewing the workpiece as a support about which the jaws turn and occurs in three distinct steps as will now be explained. If workpiece 50 shown in phantom outline in Figure 4 is inserted into the elevation showing of Figure 1 whereby it covered only about one-third of the opposing jaw face then motion of the supporting members 2 toward each other carries the jaws 10, 12 until those opposing portions of the jaws facing the workpiece engage against it as the first step in the sequence and the initial squeezing of the workpiece tends to resist further motion of members 2. Since the members are urged toward each other with great force the opposing jaw portions engaging against the workpiece can compress it to only a small degree and can move toward each other only that amount permitted by the compressibility of the metal workpiece. However the remainder of the jaw portions are still free to move toward each other because they have nothing between them. In this condition, further movement of members toward each other causes a variation along a line normal to the teeth in the coaction between cams 6 and 8 and cam surfaces 14 and 16 whereby only those portions of the jaw cam surfaces corresponding to the jaw surfaces engaging against workpiece cooperate with like portions of the member cam surfaces to cause the jaw cams to ride up the member cams and force the end portion of the jaws corresponding to the workpiece position toward each other. This action is that of riding up the slope of surfaces 6 and 8 at the end thereof and the end teeth bottom as is shown in Figure 4 and is the second step in the operation. Since there is no workpiece between the rest of the jaws the interengaging teeth remain in the open position because of the lack of cooperative action between the remaining cam surfaces. The extreme outer teeth bottom first as illustrated in Figure 4, and since this action is accomplished in the before described second step engagement between the jaw and the workpiece the bottoming occurs at relatively small friction or squeezing of the workpiece. The third and final step follows from further urging of members 2 together, perhaps only a few fractions of a mil and causes further cam surface reac-

tion along the line normal to the teeth wherein the remaining teeth attempt to bottom thus rotating about the first bottomed end teeth as a fulcrum. This motion results in progressively increasing pressure values because of the additional squeezing caused by members 2 so that maximum friction between the jaws and the workpiece occurs at or near the center of the jaws.

In the operation of the machine, the strip of metal 50 to be stretched or shrunk is placed in position on the lower pair of jaws, as illustrated in Fig. 4. The machine is then operated to bring the supporting members together to clamp the metal between the jaws. Further pressure on the supporting members causes the jaws 10, 12 of each pair to move toward each other on the cam surfaces 6, 8 against the pressure of springs 46, 48 causing the teeth 42, 44 on one jaw to project into the complementary slots in the adjacent jaws. As stated hereinbefore, the openings or slots on complementary jaw members are larger than the teeth which are received therein and the jaw retainer pins 34, 36 are smaller than the openings in the jaw in which they are received. The purpose of this is to permit the jaws to be displaced angularly from one edge of the jaw to the other, as shown in Fig. 4, thereby producing greater friction on the metal strip on that portion thereof nearest the center of the jaws and permitting a greater degree of accuracy in the stretching or shrinking of the strip by positioning the strip in the desired location relative to the center of the jaws. After the metal has been upset, pressure is relieved from the supporting members and the jaws resume their normal position. It should be remembered that the clearance between the retaining pins and the openings in which they are received is not too great, as the retaining pins must act as guides during the pressure operation to prevent angular engagement of the teeth on complementary jaws and subsequent damage to the teeth.

What is claimed is:

1. A device for upsetting a strip of sheet metal comprising in combination a pair of members coaxially supported for movement toward each other, a pair of con-

verging cam surfaces formed on each said member, a pair of metal gripping jaws in sliding engagement with the said cam surfaces, a series of alternating interengaging teeth formed on each pair of jaws, the apertures formed between adjacent teeth being formed to be larger than the teeth which are adapted to be projected therein to permit rotation of the jaws toward each other, resilient means interposed between each pair of jaws for yieldingly urging the jaws apart in a direction tending to disassociate the teeth, retainers positioned adjacent the outer ends of the jaws of each jaw pair for limiting the outward travel of the jaws under the urging of the resilient means, guide pins disposed parallel to the cam surfaces secured to the retainers and projecting inwardly into recesses in the jaws, the diameters of the associated recesses being great enough to permit jaw rotation, whereby upon axial movement of the jaws toward each other and interposition of a workpiece between a portion only of the opposing pairs of jaws, movement of the jaws toward each other is opposed by their engagement with the workpiece and as axial movement continues portions of the member cam surfaces corresponding to the workpiece engaged jaw portions cooperate with like portions of the jaw cam surfaces to move only the workpiece engaging jaw portions together to first bottom the end teeth and then rotate the jaws toward each other about the end teeth as a fulcrum and in a plane parallel to the workpiece.

2. The invention as set forth in claim 1 wherein the clearance formed between alternate interengaging teeth is normal to the direction of motion of the jaws toward each other.

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