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(54) METAL FORMING TOOL FOR HAND BEADING

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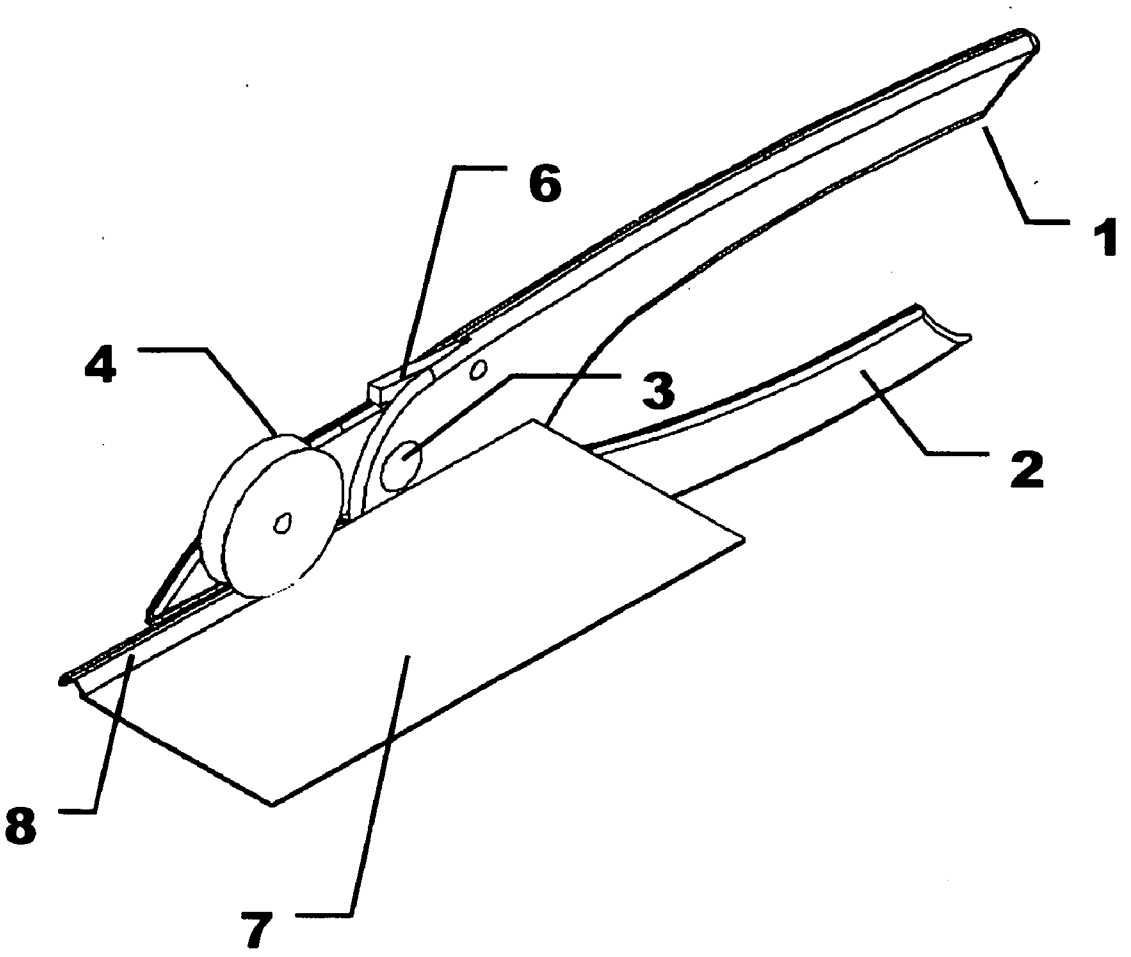
(57) ABSTRACT

A portable hand beading tool having a pair of handles pivoted together for relative rotation about a pivot axis. The tool has a pair of spindles each mounted on a respective handle and rotatable about spindle axes parallel to the pivot axis. The spindles have adjacent circumferential surfaces separated by a variable width gap controlled by relative rotation of the handles about the pivot axis so that a workpiece may be clamped between the spindles. The circumferential surfaces of both spindles have mating profiles that are formed on a workpiece clamped between the spindles. A multi-position lock holds the handles in position during workpiece deformation. The tool is positioned parallel to the edge of the workpiece so that on passage of an edge of said workpiece between the counter-rotating spindles, the workpiece is deformed by the spindles to form a continuous bead profile.



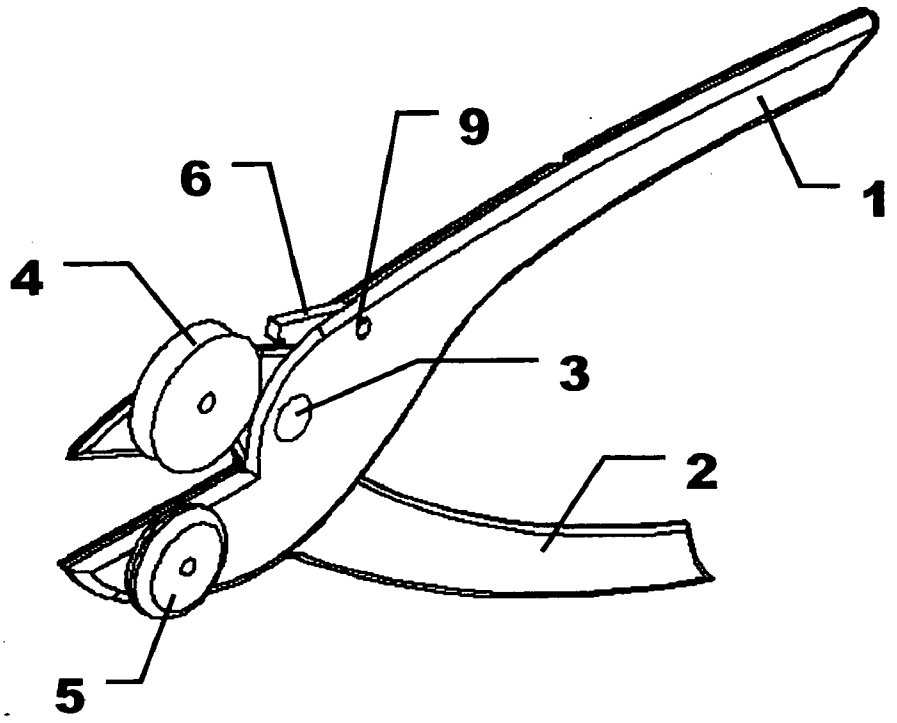


Fig. 1

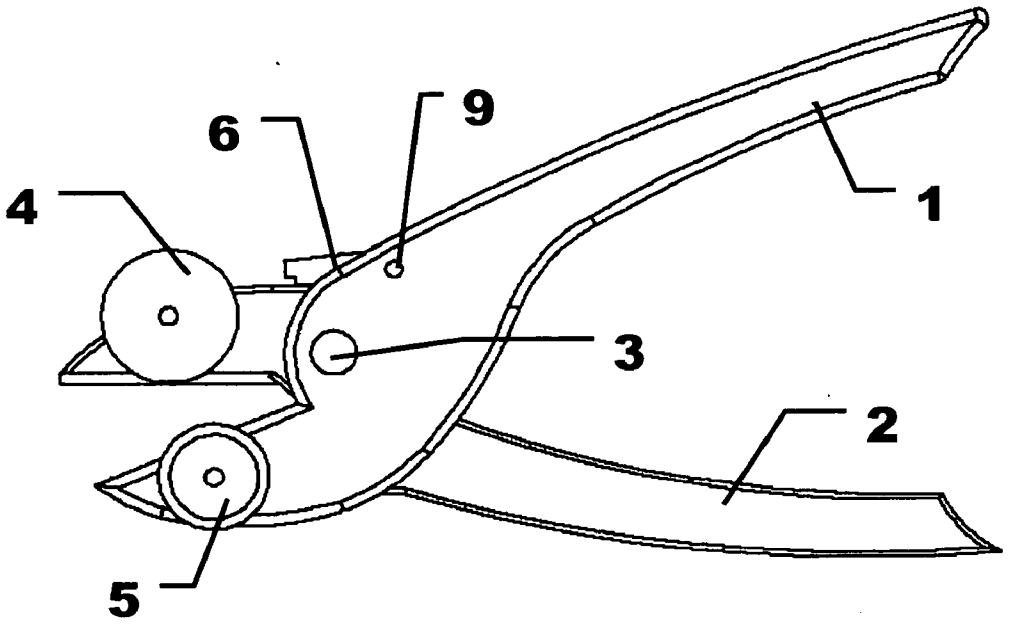


Fig. 2

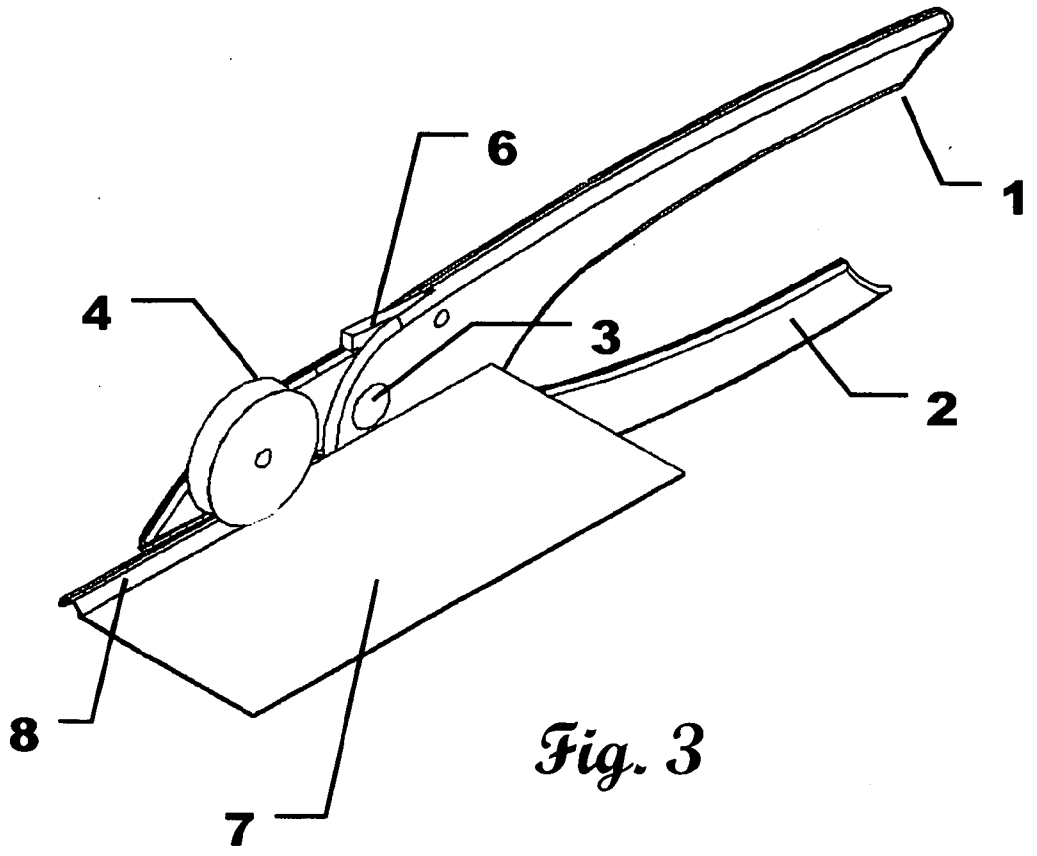


Fig. 3

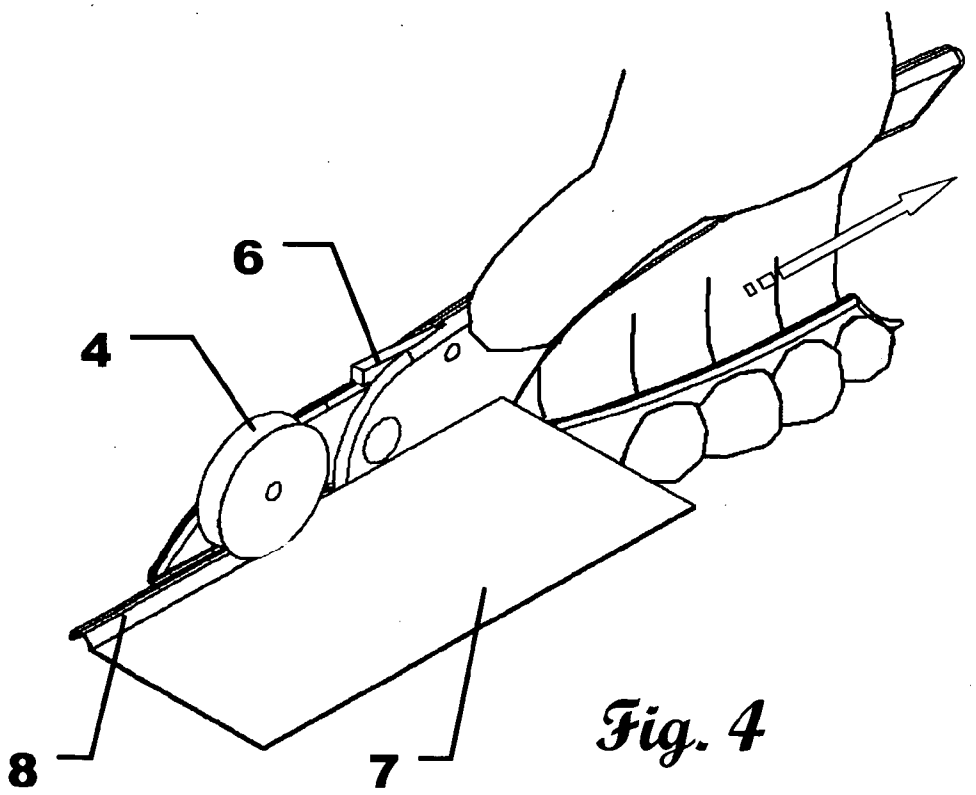


Fig. 4

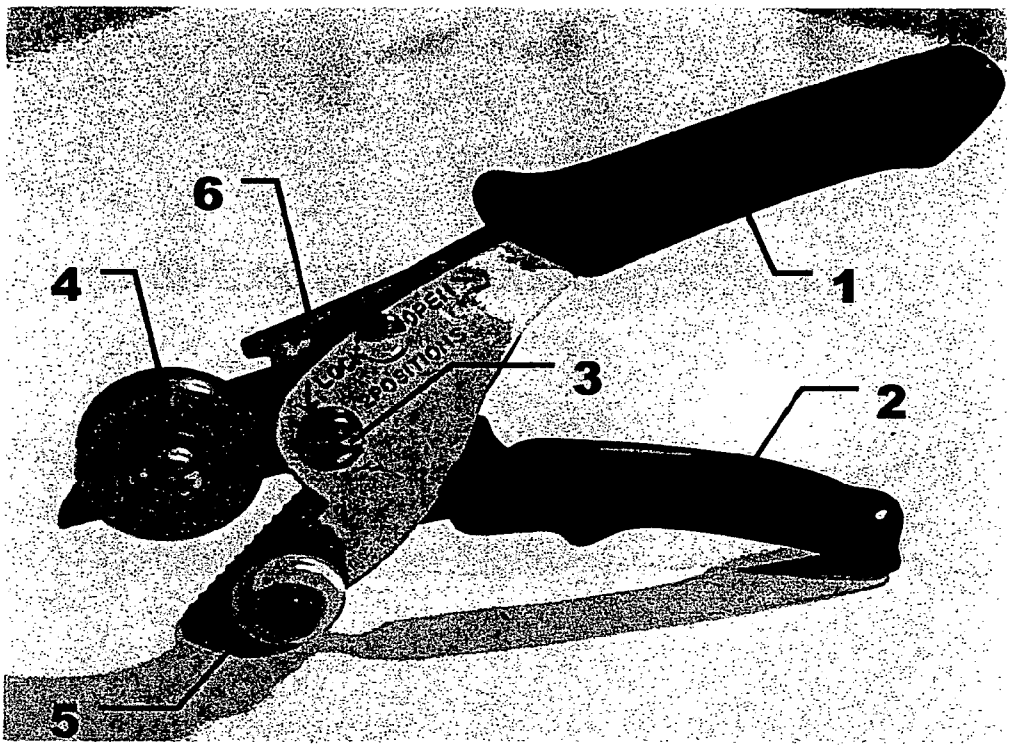


Fig. 5

METAL FORMING TOOL FOR HAND BEADING

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Applications 60/491,009 filed May 11, 2004 and is herein incorporated by reference.

TECHNICAL FIELD

[0002] The field of the invention is generally metal forming tools, and specifically, hand tools that form beads and other profiles in workpieces.

DESCRIPTION OF THE BACKGROUND ART

[0003] Various types of metal forming tools are known. U.S. Pat. No. 74,601 discloses pliers for bending sheet metal. The pliers have a hollow or concave jaw that cooperates with a corrugated or ribbed jaw.

[0004] U.S. Pat. No. 978,430 shows a tool for forming dental crowns. The tool comprises a concave jaw and a convex jaw which carries tooth-like dies for shaping a crown to final form.

[0005] U.S. Pat. No. 2,347,390 teaches a tool for forming a non-continuous hand bead in incremental forming steps, without using spindles, as applied by multiple individual bead sections with the tool positioned perpendicular to the edge of the workpiece such as sheet metal.

[0006] U.S. Pat. No. 2,556,538 teaches a tool for repairing automobile moldings. The tool includes one jaw provided with a channel or gutter and another jaw provided with a shaping or molding rib.

[0007] U.S. Pat. No. 2,583,625 illustrates a tool for crimping tubular members, such as electrical terminals, onto electrical connectors. The tool has an indentor jaw with alternate depressions and protrusions, and two of the protrusions function as forming elements. The tool also has a nest jaw provided with alternate depressions and protrusions, and two of the depressions cooperate with the forming protrusions on the indentor jaw to crimp tubular members.

[0008] U.S. Pat. No. 2,637,231 discloses tube-bending pliers. The two jaws of the pliers are formed with complementary, part cylindrical, V-shaped grooves.

[0009] U.S. Pat. No. 2,828,780 shows wire-forming pliers. One jaw of the pliers is provided with a die slot while the other jaw is provided with a forming projection which forces the free end of a wire into the die slot so as to shape the end of the wire.

[0010] U.S. Pat. No. 3,597,775 teaches a tool for making sinkers to be used with a fishing line. Each of the jaws has alternating depressions and protrusions, and two of the protrusions on one jaw cooperate with two of the depressions on the other jaw. The protrusions, which cooperate with the depressions respectively, function to form a groove in a sinker and to open a sinker.

[0011] U.S. Pat. No. 3,680,351 illustrates pliers for producing dilations in a branch pipe to be connected to a main pipe. One jaw of the pliers is provided with a hole and the other jaw of the pliers is provided with a projection that is arranged to enter the hole.

[0012] U.S. Pat. No. 3,956,950 discloses a tool for forming eyes on electrical wire. The tool comprises a first elongated jaw having a semicircular, longitudinally extending passage with spaced, transversely extending grooves for wires of different size. The tool further comprises a second elongated jaw of truncated configuration designed to cooperate with the first jaw.

[0013] U.S. Pat. No. 4,739,918 shows a tool for producing raised dimples in header plates. The tool includes two jaws, and one of the jaws has an end face provided with a part-spherical recess while the other jaw has a projection with a part-spherical end. The recess is designed to receive the part-spherical end of the projection.

[0014] U.S. Pat. No. 4,825,676 teaches a metal forming tool with a driving means for forming a step or flange in sheet metal.

[0015] U.S. Pat. No. 5,084,935 teaches a multipurpose, pliers-like tool for use in dentistry. Among the many features of the tool are two pairs of complementary male and female corrugating elements, a wire bending arrangement including an elongated groove and an elongated rib receivable in the groove, and a channel which can receive, in part, the free end of a cone.

[0016] French Patent No. 669,598 illustrates a tool having a first jaw with a wide, arcuate channel and a second jaw with a narrow groove.

[0017] Swiss Patent No. 44,706 discloses a tool with two sets of dies. Each die is formed with an arcuate groove.

[0018] None of the above tools is designed to form a continuous circumferential bead in sheet metal stock at a fixed distance from the edge of the sheet metal stock.

SUMMARY OF THE INVENTION

[0019] A portable hand beading tool having a pair of handles pivoted together for relative rotation about a pivot axis. The tool has a pair of spindles each mounted on a respective handle and rotatable about spindle axes parallel to the pivot axis. The spindles have adjacent circumferential surfaces separated by a variable width gap controlled by relative rotation of the handles about the pivot axis so that a workpiece may be clamped between the spindles. The circumferential surfaces of both spindles have mating profiles that are formed on a workpiece clamped between the spindles. A multi-position lock holds the handles in position during workpiece deformation. The tool is positioned parallel to the edge of the workpiece so that on passage of an edge of said workpiece between the counter-rotating spindles, the workpiece is deformed by the spindles to form a continuous bead profile.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] **FIG. 1** is a perspective of the hand beader viewed from the spindled side, handles open.

[0021] **FIG. 2** is a side view of the hand beader, handles open.

[0022] **FIG. 3** is a perspective of the hand beader viewed from the spindle side, handles closed, forming a bead.

[0023] **FIG. 4** is a perspective of the hand beader viewed from the spindle side, handles closed, forming a bead, single handed.

[0024] **FIG. 5** is a photograph of a working prototype.

DETAILED DESCRIPTION OF THE INVENTION

[0025] The portable hand beading tool shown in **FIGS. 1 and 2** comprises a pair of handles **1**, **2** made from steel forgings which are pivoted together by bolt **3** passing through holes in the forgings and secured by a nut (not shown). The handles are dimensioned and shaped so that both their free ends are easily grasped in one hand and pressed together by an operator. Rigidly attached to the end of handle **2** adjacent the pivot is a female spindle **4** which projects outwardly parallel to the axis of the pivot. Rigidly attached to the end of handle **1** is a male spindle **5** which similarly projects outwardly, parallel to and beside female spindle **4**. Male spindle **5** mounts in a hole in handle **1** with a nut securing male spindle **5** to handle **1**. Female spindle **4** mounts in a hole in handle **2** with a nut securing female spindle **4** to handle **2**. Both spindles and holes are arranged so that as handles **1** and **2** pivot relatively to each other about bolt **3** the distance separating spindles **4** and **5** in their radial direction is varied. Multi-position lock **6** pivots around pin **9** to lock the handles in a closed position.

[0026] Female spindle **4** has a convex circumference surface and male spindle **5** has a concave circumference surface arranged so that the surfaces mate and overlap when the handles **1** and **2** are closed, that is they are relatively close together so that spindles **4** and **5** are relatively close. These spindle surfaces do not overlap when the handles are open. Thus, when the handles **1** and **2** are open, the tool may be positioned so that the edge of a workpiece **7**, such as sheet metal, is located between the spindles with the tool handles parallel to the workpiece **7** edge. When the handles are closed so that the spindle circumferential surfaces mate, as seen in **FIGS. 3 and 4**, the workpiece **7** is deformed to form a bead profile **8** near the edge. The handles are then locked closed using multi-position lock **6** and the tool is pulled parallel to the fixed workpiece **7** edge to form a continuous bead profile **8** in the workpiece **7**. The bead profile **8** is continuous and does not require multiple tool engagement taught in the prior art where incremental bead sections are formed to simulate a continuous bead. While pulling the tool, both spindles **4** and **5** rotate counter to each other and the tool is moved along the workpiece **7** edge to form a continuous bead profile **8** of constant width and depth. During this operation the handles are conveniently held with one hand to free the other hand for positioning the workpiece **7**.

[0027] In the device shown in the drawings the spindles are firmly attached to the handles so that they are not splayed out by the force exerted by the workpiece on the spindles during deformation. However the radius of the circumferential surfaces of the spindles is relatively small so that the tool is easily maneuvered along a metal edge, which may have curves of relatively small radius.

[0028] In the tool shown in the drawings the spindle circumferences are rounded so that the profile of the bead formed is perpendicular to the plane of the workpiece. Alternatively the spindle circumferences may be of different shapes to provide different profiles, the opposed portions of the spindles still being complementary to each other. For example the spindles may be half-round, quarter-round, triangular, frusto-conical, or other profile to provide a bead which is oblique or non-symmetric to the plane of the workpiece.

[0029] When the tool is used it is very desirable that the gap between the spindles should be constant as the spindles move along the workpiece edge, as otherwise the magnitude of the bead formed will vary; also when the workpiece is of soft metal such as aluminum the sheet may become thinned if the spindles are held too closely together. The multi-position lock **6** on the tool has multiple settings to compensate for workpiece material variances whereby the spindles may be set at the desired separation when the workpiece is first clamped between them and this separation is then held constant as the tool moves along the workpiece edge.

[0030] The invention has been described in terms of specific embodiments which are indicative of a broad utility but are not limitations to the scope of the invention. Additions and modifications apparent to those with skill in the art are included within the scope and spirit of the invention.

I claim:

1. A portable hand beading tool comprising;

a pair of handles pivoted together for relative rotation about a pivot axis,

a pair of spindles each mounted on a respective handle and rotatable about spindle axes parallel to said pivot axis, the spindles having adjacent circumferential surfaces separated by a gap, the width of the gap being variable by relative rotation of the handles about the pivot axis so that a workpiece may be clamped between the pair of spindles,

the circumferential surfaces of the pair of spindles further comprising at least one mating profile formed onto said workpiece clamped between the pair of spindles,

a multi-position lock for holding said handles in position during workpiece deformation,

said tool positioned parallel to the edge of said workpiece so that, on passage of said workpiece between counter-rotating spindles, a continuous mating profile is formed on said workpiece while said handles maintain a fixed gap width.

2. The tool of claim 1 wherein said handles are steel forged material.

3. The tool of claim 1 wherein said at least one profile is selected from the group consisting of half-round, quarter-round, triangular, and frusto-conical.

4. The tool of claim 1 wherein said workpiece material is selected from the group consisting of sheet metal and aluminum.

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