United States Patent [19]

Mann

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[54] **BOW FORMING PLIER**

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[73] Assignee: **Henry Mann, Inc.,** Feasterville, Pa.

[22] Filed: **Aug. 8, 1973**

[21] Appl. No.: **386,753**

[52] **U.S. Cl.** **140/106,** 32/66
[51] **Int. Cl.** **B21f 1/06**
[58] **Field of Search** ..... 140/102.5, 104, 106; 32/14 R, 66, 40 R; 72/409; 81/352

[56] **References Cited**

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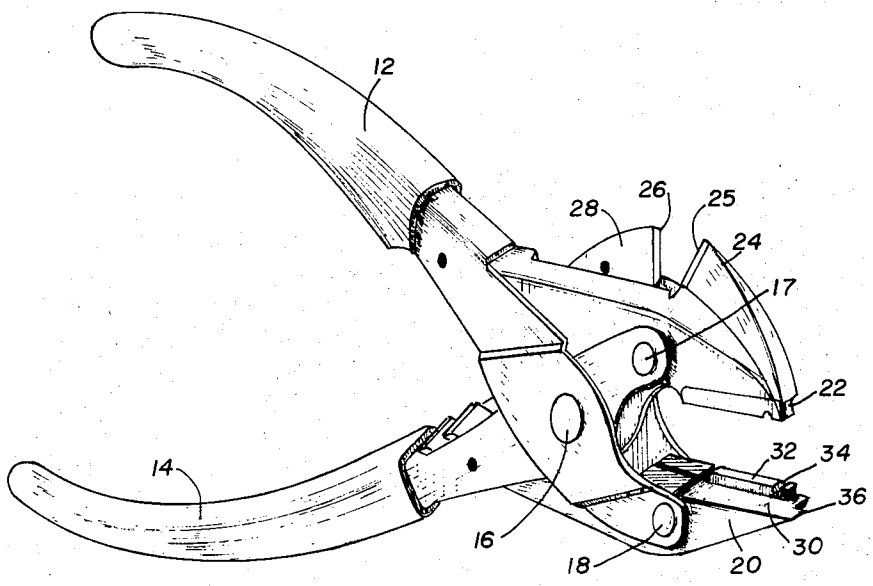
Primary Examiner—Lowell A. Larson
Attorney, Agent, or Firm—Ralph R. Roberts

[57] **ABSTRACT**

This invention pertains to a parallel jaw plier having a pair of wire cutters manipulated by the opening and closing of the handles. The jaws of the plier are operated in a parallel manner to move complementary configurations formed in the jaws whereby the ends of the wire may be bent into closed or open loops or bayonet stops to provide a precise configuration and a series of like sized loops in the wire. The jaws are so constructed that the wire which is to be bent may be made as an offset bend or bayonet stop or a start of the bow. The jaws are particularly adapted so that wires may be formed into an outer bow loop which may be either a closed or open loop.

4 Claims, 8 Drawing Figures



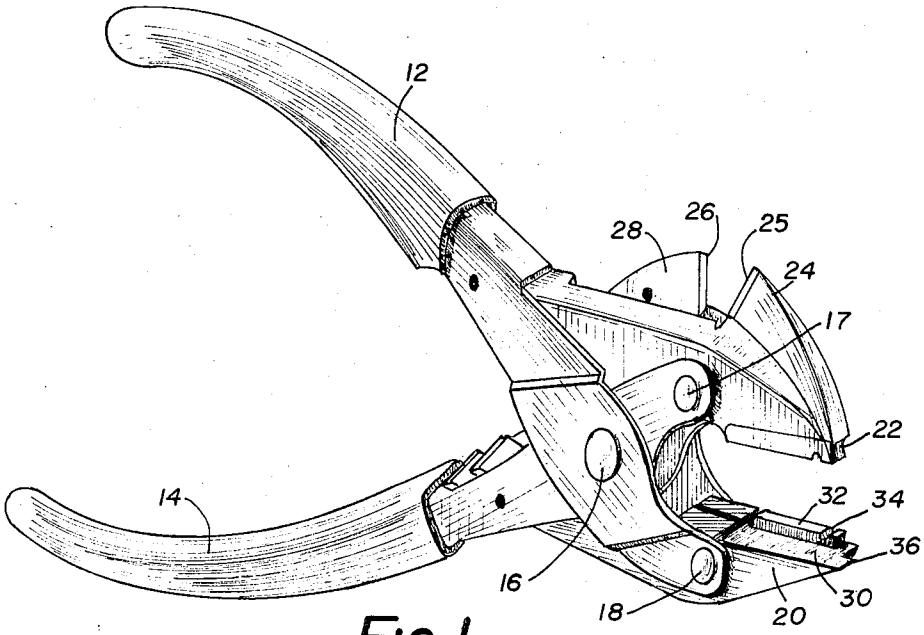


FIG. 1

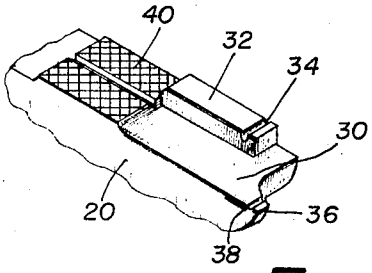


FIG. 2

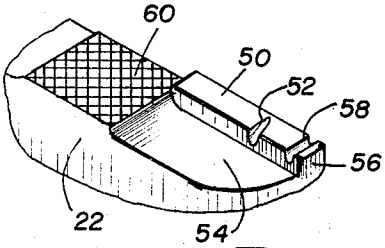


FIG. 3

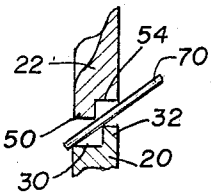


FIG. 4

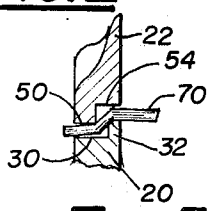


FIG. 5

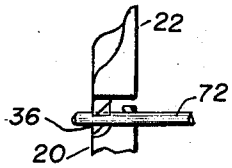


FIG. 6

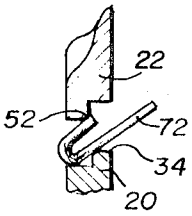


FIG. 7

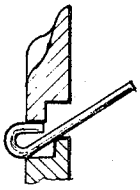


FIG. 8

BOW FORMING PLIER

CROSS-REFERENCE TO RELATED INVENTIONS

The plier of this invention pertains in a related manner to a parallel jaw plier such as shown in U.S. Pat. No. 3,710,657 which is assigned to the assignee of this invention. This patent was issued on Jan. 16, 1972 in the name of Anthony J. Cusato and assigned to Henry Mann, Inc.

BACKGROUND OF THE INVENTION

1. Field of the Invention

In accordance with the classification of art as established in the United States Patent Office this invention may be found in the general Class entitled, "Tools" (Class 81) and more particularly in the subclass entitled, "with means for parallel movement of work engaging surfaces" (subclass 352).

2. Description of the Prior Art

Parallel jaw pliers, of course, are not unique and as noted above a parallel jaw plier is shown in U.S. Pat. No. 3,710,657 as issued to Anthony J. Cusato on Jan. 16, 1972. Pliers whose jaws are particularly configured to provide loops such as are used in orthodontics as far as is known are confined generally to round or needle-nose pliers in which the wire is grasped and rolled around one of the jaws of the pliers.

SUMMARY OF THE INVENTION

This invention may be summarized at least in part with reference to its objects.

It is an object of this invention to provide, and it does provide, a bow forming plier in which the jaws have mated grooves and offset configurations so constructed that precise loops and offsets may be formed in the wire.

It is a further object of this invention to provide, and it does provide, a parallel jaw plier in which there is a loop forming groove, a loop closing groove and a bend offset enabling a bend or stop to be formed.

This bow forming plier is a parallel jaw plier particularly useful for orthodontists. In addition to a wire cutting means there is formed in hardened inserts in the jaw faces an offset permitting the wire to be bent into an offset or bayonet stop. Adjacent this offset portion is a loop forming groove which initially forms a partial loop and then is used to close the loop. An adjacent loop forming groove is provided to shape, close and/or open loops.

In the present invention the bow forming plier is adapted for heavy duty forming of wire of several sizes and as such is provided with a jaw specially adapted to form loops or offsets in the wire of a determined nature and at a determined place. This configuration of the jaws as shown in the drawing permits the wire forming to be precisely controlled and where desired repeated within very close limits. In particular, the parallel jaw action of the plier permits the wire to be gripped in a precise manner and as the jaws are brought together there is no change in relative angles so that the wire when gripped in the jaw firmly retained in specially formed notches in the upper and lower jaws when the jaws are brought to the desired gripping condition is formed into the desired loop. The plier, to be hereinafter more fully described, has a cutting means formed exterior of the forming jaws. These cutting edges are

formed as members which are movable by the handles while there is no wire between the jaw portions. The jaws of the plier are used to form special offset portions and loops or bows in the wire.

In addition to the above summary the following disclosure is detailed to insure adequacy and aid in understanding of the invention. This disclosure, however, is not intended to prejudice that purpose of a patent which is to cover the inventive concept therein no matter how it may later be disguised by variations in form or additions of further improvements. For this reason there has been chosen a specific embodiment of the bow forming plier as adopted for use in forming loops, offsets and the like in wire particularly used by orthodontists. This specific embodiment has been chosen for the purposes of illustration and description as shown in the accompanying drawing wherein:

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 represents an isometric view of the bow forming plier of this invention with the jaws in an open condition whereat either the wire may be cut by the wire cutters or the wire to be acted on may be brought to the jaws for forming or bending;

FIG. 2 represents an isometric view of the lower jaw of this plier assuming that this bow forming plier is positioned with the wire cutting jaws in the top or upper posotion. The lower jaw includes a shelf with loop forming assists and at the forward or distal end is a narrow shelf used with the upper jaw to form the loop;

FIG. 3 represents an isometric view of the upper jaw which mates with the lower jaw, in this view it is assumed that the jaw has been rotated one hundred-eighty degrees from the position of FIG. 1 for the purposes of illustration and description;

FIG. 4 represents a fragmentary sectional view showing the upper and lower jaws of the plier in the position of FIG. 1 with the jaws being brought together to initially start a bend mark on a wire inserted between the jaws;

FIG. 5 represents a sectional view of the jaws and wire of FIG. 4 when and as the jaws are brought together to form an off-set bend or stop;

FIG. 6 represents a sectional view of the distal end of the jaws showing a wire placed in groove portions formed in the upper and lower jaws and in cooperation with a mating groove portion formed in the upper jaw the wire is formed into a partial loop;

FIG. 7 represents a sectional view of the jaws with a partially formed loop of the wire placed in the loop holding grooves and prior to the jaws being closed, and

FIG. 8 represents a sectional view of the jaws and wire of FIG. 7 after the jaws are moved to cause the wire loop to be squeezed into its closed condition.

In the following description and in the claims various details will be identified by specific means for convenience; these names, however, are intended to be generic in their application. Corresponding reference characters refer to like members throughout the several figures of the drawing.

The drawing accompanying, and forming part of, this specification discloses certain details of construction for the purpose of explanation but it should be understood that structural details may be modified in various respects without departure from the concept and principles of the invention.

DESCRIPTION OF THE BOW FORMING PLIER OF THIS INVENTION

Referring now to the embodiment as seen in FIGS. **1** through **3** there is depicted a parallel jaw plier having handles **12** and **14** which are pivoted by and actuate pivots **16, 17** and **18.** The movement of these handles and the connected retaining means used with the rear portions of the normal parallel jaw configuration cause lower jaw member **20** and upper jaw member **22** to be moved toward or away from each other in a conventional parallel movement manner.

On the upper jaw **22** is carried an upwardly extending cutting jaw member **24** having a cutting edge **25** which cooperates with a like cutting edge **26** formed on upwardly extending rear portion **28.** Portion **28** is link member carried by pivots **16** and **17.** Where the cutting edges **25** and **26** occur hardened inserts of tool steel or carbide are provided on member **24** and portion **28.** This wire cutting means is conventionally known and is merely shown by a means of illustration and no patentability is ascribed thereto. Wire cutting ability is desired in the bow forming pliers so as to cut the wire conveniently and the visibly exposed shear-type compression-type cutting means depicted is one means.

The lower jaw **20** is a hardened tool steel insert and has its working surface formed with a shelf portion **30.** Also formed in the lower jaw is an upwardly extending portion **32** generally made as a square member which, as reduced to practice, is made approximately one-eighth inch wide and three thirty-seconds of an inch high. Near the front or outer end of this upward extending portion **32** is formed a groove **34** which is sized to removably retain the largest wire to be found with this bow plier. This groove **34** is semicircular and has a rounded bottom in which a wire may be nested without distorting or deforming the surface of the wire. This jaw shelf portion **30** as it extends outwardly is reduced in width to form an extending tongue member which, as reduced to practice, is approximately one-eighth of an inch in width. This extending tongue member, identified as **36,** has formed therein a shallow wire retaining groove **38** which is best seen in FIG. **2.** To the rear of the upwardly extending portion **32** and slightly above the shelf portion **30** is a planar portion **40** haing a knurled surface. This knurled surface in combination with the upper jaw provides a support on and between which the wire may be straightened if it has been brought to an undesired bent configuration.

Referring next to FIG. **3** there is depicted the upper jaw rotated 180° for illustrative purposes. This upper jaw **22** is made so as to mate with the lower jaw **20** when the jaws are brought together. This upper jaw is also an insert of hardened metal such as tool steel. In the upper jaw which is opposite the shelf **30** of the lower jaw is formed a downwardly extending rectangular shelf member **50** which has a depth substantially identical to the depth of member **32** formed on the lower jaw. This member **50** may be slightly wider or substantially the same width as the jaw **32.** In this upper jaw member **50** and spaced so as to be positioned exactly in alignment with groove **34** when the jaws are brought together is a sloped notch **52** for a purpose to be hereinafter later described. This notch has a semicircular configuration made at about 45° to the flat surface of member **50.** A planar surface **54** is formed on the jaw and is below shelf member **50.** The forward end of this jaw is rounded to bring the forward portion of this jaw at end **56** to a width which is approximately the same width as the downwardly extending jaw portion **50.** In this manner **50** and adjacent the end of **56** is formed a groove **58** which is also semicircular. This groove **58** is deeper than groove **38** but is complementarily aligned with it when the upper and lower jaws are brought together. In the back porton of this jaw **22** is formed a flat knurled surface **60** which cooperates with knurled surface **40** in the lower jaw for the gripping and flattening of wire when required.

Use and Operation

Referring now to FIGS. **4** and **5** it is to be noted that a wire **70** after it has been cut as between the cutting edges **25** and **26** of members **24** and **28,** as seen in FIG. **4,** may be placed between upper and lower jaws **20** and **22.** Initially the wire is engaged by member **32** and member **50.** Both members are approximately the same depth, however, they are displaced sideways from each other to prevent cutting or shearing. As seen in FIG. **5,** when the jaw **22** is moved toward jaw **20** the wire **70** is bent to nearly a Z-shape. This offset in the wire is provided by the extending member **32** as it engages the wire between that member and planar surface **54** and the number **50** as it engages the wire and presses it toward the shelf portion **30.** The bent wire is then technically described as having a bayonet bend or stop.

Referring now to FIGS. **6, 7** and **8** it is to be noted that where a wire is to be bent or formed into a loop the grooves **38** and **58** as well as the notch **34** and the groove **52** are utilized. The wire end is gripped in grooves **38** and **58** and as viewed in FIG. **6** the closed plier is then rotated in a counterclockwise direction. The longer length of wire is thus brought around the rounded undersurface of extending tongue **36** to form the open loop seen in FIG. **7.** This incomplete or open loop is then placed in groove **34** and with the other side of the in sloped notch **52** the loop is closed as in FIG. **8.**

With the loop forming portions and grooves on the small ends of the plier wire groove engaging portions **58** and **38** may be used by the operator forming the loop to easily squeeze the loop to the desired configuration. If the loop is closed to too great an extent the thin portion **36** provides on the lower jaw may be slid into a loop to force or manipulate the loop to the desired open or shaped condition.

Terms such as "left," "right," "up," "down," "bottom," "top," "front," "back," "in," "out," "clockwise," "counterclockwise" and the like are applicable to the specific embodiment shown and described in conjunction with the drawing. These terms are merely for the purposes of description and do not necessarily apply to the position in which the bow forming plier may be constructed or used.

While this particular embodiment has been shown and described it is to be understood the invention is not limited thereto and protection is sought to the broadest extent the prior art allows.

What is claimed is:

1. A plier for forming bow loops, bayonet bends and the like in a length of wire, said plier including: (a) a pair of handles secured at and movable around a pivot means; (b) a pair of jaws retained by and movable by linkage members connected to and actuated by the movement of the handles so as to be movable in a par-

allel manner toward, to and away from each other; (c) a hardened work surface formed in the lower jaw, said surface contoured to include an upwardly extending portion of generally rectangular configuration, this rectangular configuration extending generally normal to the axis of the handle pivot means, a wire retaining groove formed in the upper surface of said rectangular configuration, the center line of this groove being generally parallel to the axis of the pivot means, a shelf portion formed on the jaw and generally parallel to the top surface of the rectangular configuration and at a selected distance below this top surface of the rectangular configuration an extending narrow tongue formed at the front end of said lower jaw, a wire retaining groove formed in the top surface of the tongue, the bottom portion of this tongue partially rounded to provide a curved surface against which the wire may be bent, and (d) a hardened work surface formed in the upper jaw, said surface contoured to include a downwardly extending portion of generally rectangular configuration, this rectangular configuration extending generally normal to the axis of the handle pivot means, the rectangular configuration of this upper jaw disposed so as to be parallel to but displaced sideways from the rectangular portion on the lower jaw a distance in excess of the maximum diameter of wire to be formed, this displaced distance enabling wire to be bent into an offset bend absent cutting of the wire when the jaws are brought nearly together, a wire receiving notch formed at a sloped angle to the face of the rectangular portion and in a lower corner of said portion

which corner is adjacent the rectangular portion of the lower jaw, this notch having its axis laying in the same plane as the wire receiving groove in the upper surface of the rectangular portion in the lower jaw, a wire receiving groove formed in the distal portion of the rectangular portion of the upper jaw, this wire receiving groove complementarily formed to mate with the groove in the narrow tongue in the lower jaw, and a shelf portion formed on the upper jaw and generally parallel to the bottom surface of the rectangular configuration of the upper jaw, this shelf portion of the upper jaw spaced from the bottom surface of the rectangular portion of the upper jaw a distance substantially equal to the distance from the top surface of the rectangular portion of the lower jaw to the shelf portion formed therein.

2. A plier for forming wire as in claim **1** in which the extending narrow tongue portion of the lower jaw is as wide as and is in alignment with the rectangular portion of the upper jaw.

3. A plier for forming wire as in claim **2** in which both upper and lower jaws have knurled faced planar areas disposed opposite each other and adapted to come face-to-face and substantially together when the jaws are urged closed.

4. A plier for forming wire as in claim **2** in which the wire receiving groove in the tongue portion of the lower jaw is semicircular with a depth of less than one-half the diameter and this groove having its axis generally parallel to the axis of the pivot means.

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