Nov. 10, 1970 P. P. DEL MONICA 3,538,737

BENDER FOR WIRE AND FLAT STOCK

Filed Nov. 12, 1968 3 Sheets-Sheet 1

Fig. 1

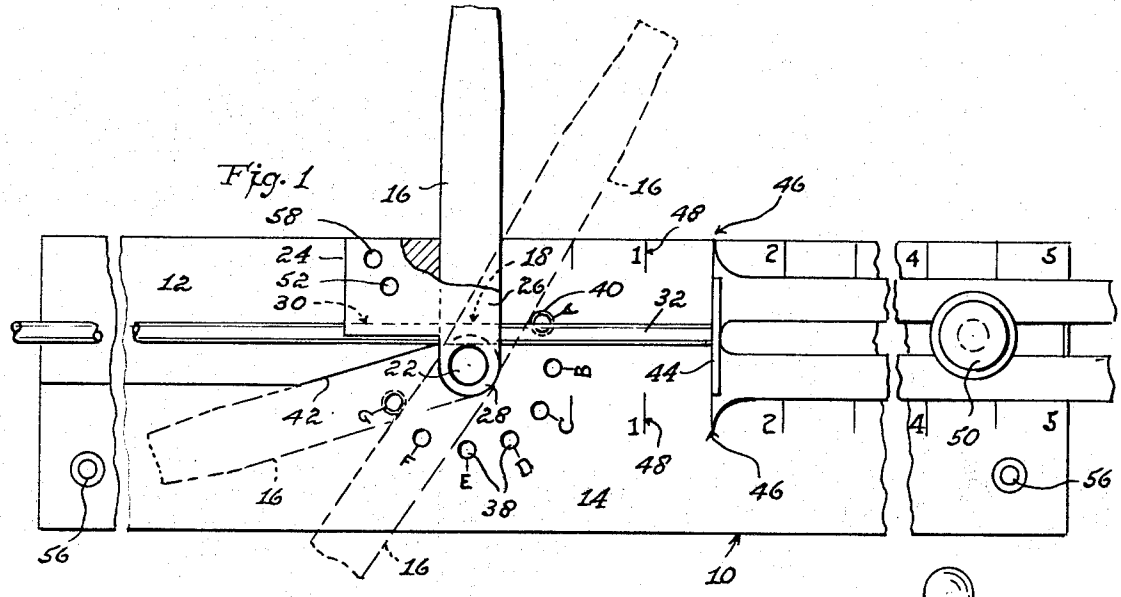


Fig. 4

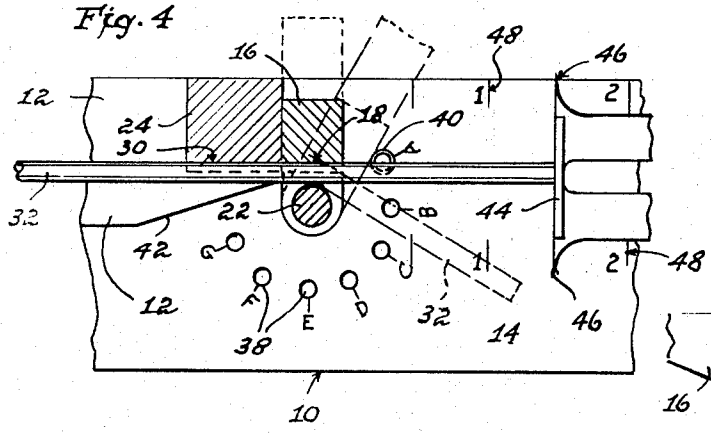


Fig. 3

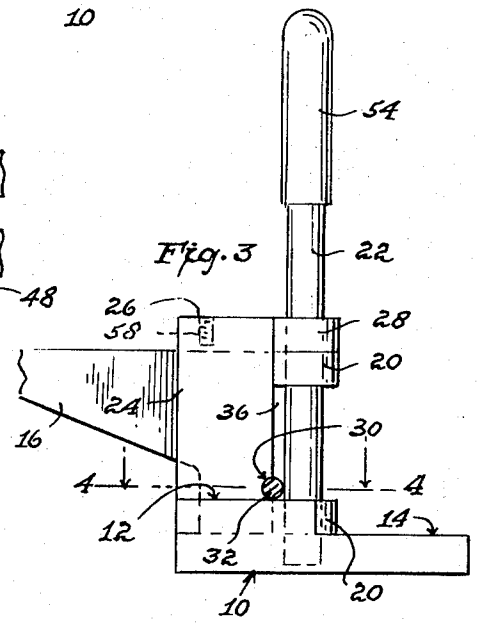


Fig. 6

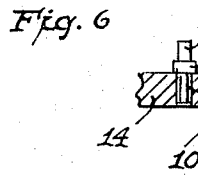
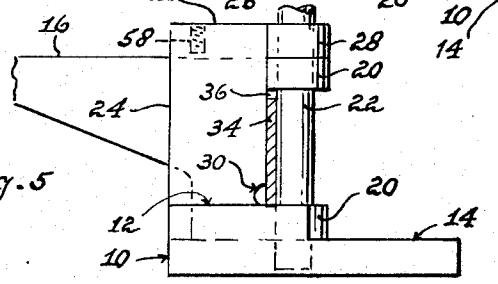


Fig. 2

Fig. 5



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BENDER FOR WIRE AND FLAT STOCK

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Fig. 7

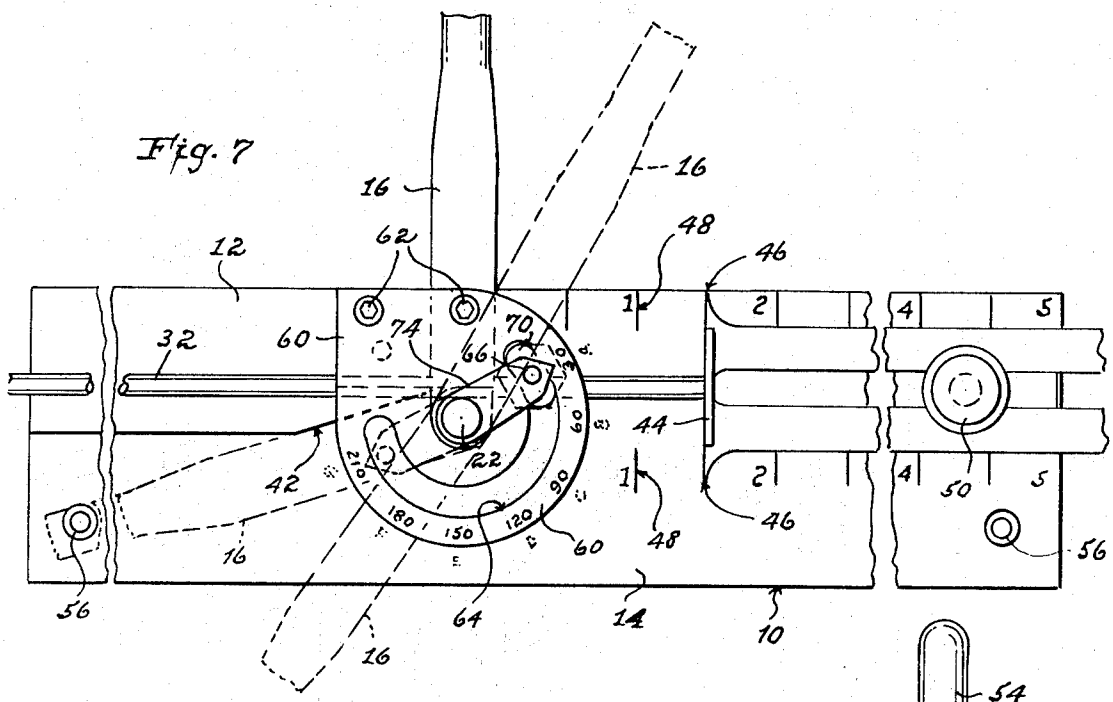


Fig. 10

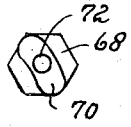


Fig. 8

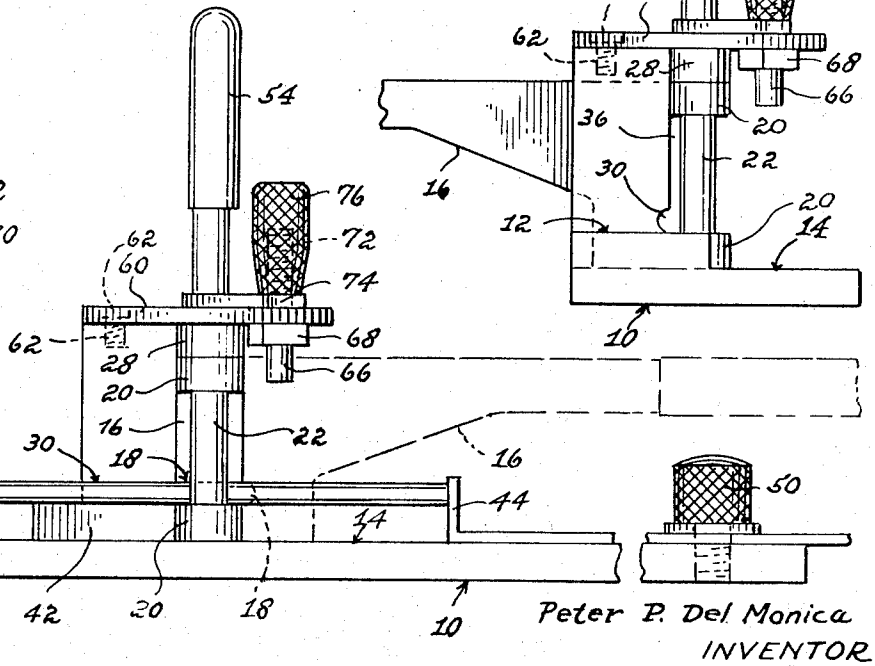
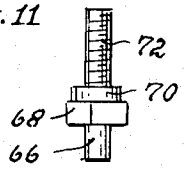


Fig. 9

Fig. 11



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BENDER FOR WIRE AND FLAT STOCK

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Fig. 12

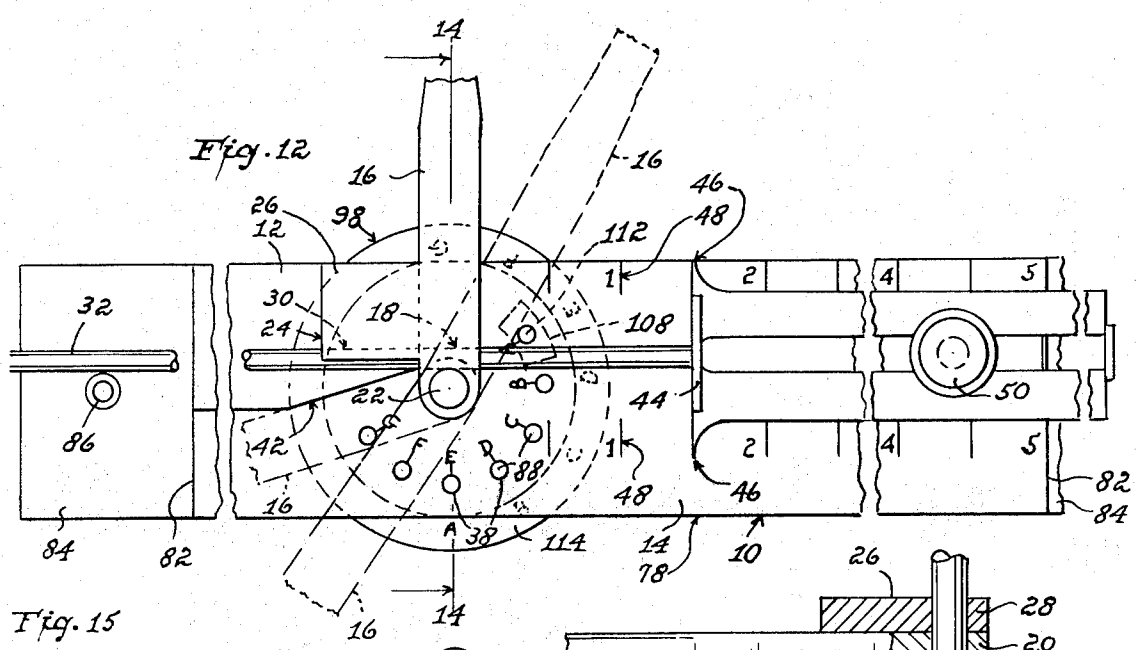


Fig. 15

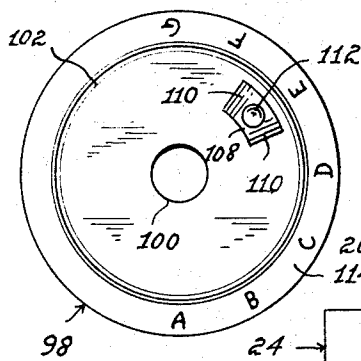


Fig. 14

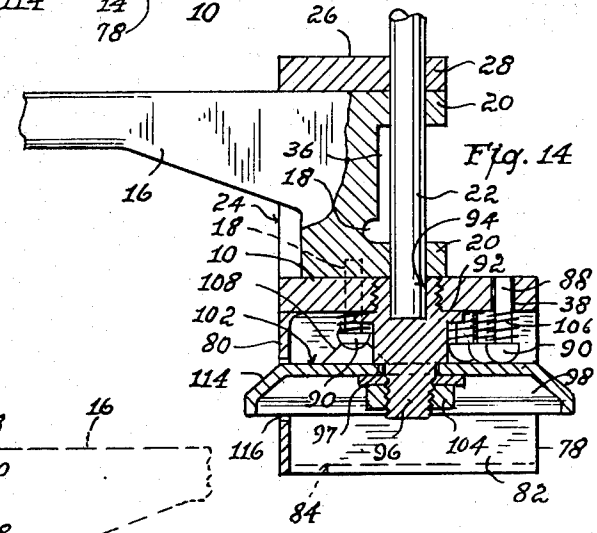
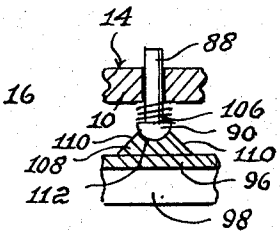


Fig. 13

Fig. 16



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3,538,737

BENDER FOR WIRE AND FLAT STOCK

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Filed Nov. 12, 1968, Ser. No. 774,644
Int. Cl. B21d 7/02
U.S. Cl. 72—388 9 Claims

ABSTRACT OF THE DISCLOSURE

A small bender designed to perform the accurate bending of both wire and flat linear stock, and in which the width of the pivoted bending lever and the diameter of an adjustable stop pin therefor are cooperative with visual indicator means at the several lever stop positions to show the precise angle of bend of the stock when the lever is moved into abutment with the stop pin at one of said positions.

This invention relates to benders for wire and flat linear stock of the general type involving a horizontal base and a bending lever pivotally mounted thereon and having therein an annular row of sockets or other means for supporting a lever stop pin in either of various positions of angular bend.

One of the objects of the present invention is to provide a small, inexpensive bender of the character mentioned adapted for the accurate single or multiple bending of either wire or flat linear stock to any desired angle or angles.

Another object of the invention is to provide a small bender of the character mentioned in which the width of the bending lever and the diameter of the lever stop pin are cooperative with visual angle indicator means at the several stop positions for automatically showing the precise angle of bend of the stock when the bending lever is moved into abutment with the stop pin at either of the stop positions.

A further object of the invention is to provide a small bender of the character mentioned including a rectangular elongated base having a rearward surface in one horizontal plane for supporting the stock and a forward surface in a lower plane on which the front end of the bending lever is pivotally mounted, so that the portion of the stock to be bent will be above the surface of the base for free abutment by the bending lever.

Another object of the invention is to provide a small bender of the character mentioned including a vertically elongated support for the bending lever and pivot pin therefor said support also serving as a stop for the lever in its starting position perpendicular to the longitudinal axis of the base.

The visual angle indicator means may consist of consecutively arranged alphabetical letters at the several lever stops, which are preferable for children or others in following a program of bends in a sheet or pamphlet containing printed illustrations of the various formations to be produced accompanied by directions stating the lengths in inches of the stock to be bent and the angles of bend, as, for example, 1–A for a one inch length to be bent to an angle identified in the instructions as 30 degrees, etc. With this arrangement even a child with the aid of a linear scale and an adjustable length stop for the wire or flat stock can quickly perform the desired number of single or multiple bends in a precisely uniform manner. For laboratory or experimental purposes the visual angle indicator means may consist of conventional protractor degree divisions.

My improved bender includes an elongated flat base of rectangular plan formation provided with the linear scale and adjustable length stop one form of which may

be of a construction similar to that shown in my design patent No. D. 211,286, issued June 4, 1968 in which the lever stop pin is insertable in sockets in the elongated base, or it may be provided with a protractor-like member detachably mounted on the top of the pivot pin support with the stop pin adjustably mounted in an annular slot. Also the stop pin may be lifted into the plane of abutting relation with the bending lever or withdrawn therefrom by means of a dial rotatably mounted in a lateral opening in a wall of the bender, the dial having letters or other angle indicator characters visible outside the opening and an inclined cam for selectively actuating several spring urged spherical or convex headed pins in the lower floor level of the bender at predetermined lever stop positions.

The pivot pin and lever support is made of substantial height to accommodate the vertical edgewise insertion of relatively wide flat stock between the top and bottom lugs of the bending lever through which the pivot pin projects. Although the width of such stock may vary, its thickness must be approximately uniform to fit closely between the vertical pivot pin and the flat inner surface of the vertical pivot pin and lever support. It is contemplated that a separate bender will be used for each cross-sectional size of wire and flat stock in view of the economical cost of the benders.

Other objects and advantages of my improved bender will be apparent or pointed out in the following specification in which reference is directed to the accompanying drawings forming a part thereof and in which

FIG. 1 is a top plan view of one form of bender in accordance with my invention, with the vertical support for the bending lever and pivot pin partly in section;

FIG. 2 is a side elevation of the bender shown in FIG. 1 also partly in section;

FIG. 3 is a rear end view of the bender shown in FIGS. 1 and 2 with the free end portion of the bending lever broken away and showing a wire or rod in position for the bending operation;

FIG. 4 is a section taken on the line 4—4 of FIG. 3 and showing the wire or rod (in broken lines) bent to an angle of 30 degrees;

FIG. 5 is a view similar to FIG. 3 but showing a length of flat stock in position for the bending operation;

FIG. 6 is a detail section showing the stop pin for the bending lever;

FIG. 7 is a top plan view showing another form of bender in accordance with my invention;

FIG. 8 is a side elevation of the bender shown in FIG. 7;

FIG. 9 is a rear end view of the bender shown in FIGS. 7 and 8;

FIG. 10 is a plan view of the lever stop pin shown in FIGS. 7–9;

FIG. 11 is a side view of the lever stop pin shown in FIG. 10;

FIG. 12 is a top plan view of still another form of bender in accordance with my invention;

FIG. 13 is a side elevation of the bender shown in FIG. 12;

FIG. 14 is a section taken on the line 14—14 of FIG. 12;

FIG. 15 is a plan view of the lever stop pin actuating and angle indicator dial shown in FIGS. 12–14; and

FIG. 16 is a detail section showing one of several spring urged lever stop pins mounted in the lower floor surface of the bender at one of the lever stop positions as lifted abutting relation with the bending lever by the inclined cam on the indicator dial, shown more clearly in FIG. 15.

Referring to the drawings in which like numerals designate like parts or elements in the several views, and re-

ferring first to FIGS. 1 to 6, the form of my improved bender illustrated in said views includes an elongated rectangular base **10** having a rearward surface **12** in one horizontal plane for supporting wire or flat stock in position for the bending operation, and a forward surface **14** in a lower horizontal plane upon which the front end portion of the bending lever **16** is rotatably seated in a vertically edgewise position so that the portion of the stock projecting forwardly from the higher surface **12** to be bent will be above the bottom edge of the bending lever **16** for free abutment thereby in the bending operation.

The front end and adjacent sides of the bending lever **16** are in rectangular relation with a horizontal groove **18**, which may be of semicircular or other suitable cross-sectional shape to receive wire stock, extending across the front end of the lever, the bottom edge of the groove being in horizontal alignment with the surface **12**. The front end of the lever also has a pair of forwardly projecting lugs **20** in vertically spaced relation having vertically aligned openings through which the pivot pin **22** projects. An elongated support **24** of rectangular cross-sectional shape projects vertically from the front end of the higher surface **12** and has a forwardly projecting flat portion **26** at its upper end in a plane for closely overlying the top of the lever **16** and having a laterally projecting integral lug **28** above the uppermost lug **20**, this lug also having an opening through which the vertical pivot pin **22** projects. The lower end of the pin **22** is seated in a socket **23** (FIG. 2) in the surface **14** of the base **10**. A groove **30** extends horizontally across the inner surface of the support **24** in coincident alignment with the groove **18** in the lever **16** when the lever is perpendicular to the longitudinal axis of the base **10**, as when the lever is in its neutral or starting position as shown in FIG. 1, with the lever stopped in that position by abutment against the front surface of the support **24**.

As shown more clearly in FIG. 3 the portion of a wire or rod **32** to remain straight is solidly supported on the higher surface **12** of the bender **10** between the back of the groove **30** and the pivot pin **22** while the portion to be bent is held in alignment by the groove **18** in the bending lever **16**; whereas, as shown in FIG. 5, a flat strip **34** is supported on the surface **12** within the narrow space **36** between the vertical support **24** and the pivot pin **22** and the end of the bending lever **16**. Otherwise the bending procedure for both kinds of stock is substantially the same.

In the form of bender illustrated the lever stop positions are provided wtih spaced openings **38** in the lower surface **14** of the bender **10** to receive the shank portion **41** of a stop pin **40**. These openings are arranged in concentric relation with the pivot pin **22** in spaced positions to effect bends of the stock to certain precise angles indicated, in the embodiment illustrated, by alphabetical letters, for example, the letter A indicating a bend of 30 degrees, the letter B indicating a bend of 60 degrees, etc. The determination of the first lever stop position is dependent upon the cooperative relation of the horizontal width of the bending lever with the diameter of the stop pin. As indicated by the broken line positions of the bending lever, a final 30 degree bend beyond the last position G may be effected by moving the bending lever into abutment with an inclined edge **42** of the higher surface **12**.

The bender is provided with an adjustable length stop member **44** which may have two lateral indicator points **46** between a pair of linear scales **48**, the stop member being held in its adjusted positions by means of an ordinary clamping screw **50**. A socket **52** may be provided in the top of the support **24** to receive the shank **41** of the stop pin **40** when it is not in use.

The pivot pin **22** is provided with a handle **54** (FIG. 3) for convenience in disassembling the bending lever **16**

from the base **10** but, for clarity of illustration, this pin is shown in FIGS. 1 and 4 with the handle removed.

The bender may be secured to a table or bench by means of screws inserted through openings **56** in the base **10**.

A pair of threaded screw openings **58** in the top of the vertical support **24** are provided for the attachment of an alternate stop pin assembly to be described.

As previously mentioned it is contemplated that a bending program sheet or pamphlet (not shown) containing printed illustrations of various bent forms in wire and flat stock with directions for setting the adjustable length stop **44** and the lever stop pin **40** in producing the forms will be made available to users of the benders.

The structural features and operation of the bender shown in FIGS. 7 to 11 may in many respects be identical with those of the bender shown in FIGS. 1 to 6. Therefore, like parts or elements are designated by like numerals in all the views.

The difference between the two forms of the invention resides mainly in the provision of a protractor-like indicator member **60** for attachment to the top of the vertical pivot pin support **24** shown in FIGS. 1 to 6. The rear and outer edges of this member in attached position are in right-angular relation in longitudinal alignment with the base **10** and merging into a circular portion forwardly and inwardly from the support **24** and having a central opening through which the pivot pin **22** projects. It may be removably attached to the support **24** by means of headed screws **62** projecting into the previously mentioned openings **58**.

The indicator member **60** has a concentric slot **64** inwardly from the circular edge of the member with certain angles of bend of the stock indicated in degrees, instead of alphabetical letters, at the lever stop positions. The stop pin **66** is designed to project below the indicator member **60** and it depends from a flange portion **68** having an arcuate portion **70** for slidable insertion in the slot **64**. A threaded stud portion **72** projects upwardly from the portion **70**. A flat angle indicating pointer **74** has an opening at its inner end to fit over the pivot pin **22** and an opening at its outer end to fit over the stud portion **72**, which has a clamping nut **76** for clamping the stop pin **66** to the member **60** in either of the lever stop positions for abutment by the bending lever **16**. The stop positions as shown are spaced at 30 degree angles but may be minutely spaced to effect any desired angle of wire or flat linear stock.

In the form of bender shown in FIGS. 12 to 16, as in the form shown in FIGS. 7 to 11, many of the features of construction and operation may be identical with those of the form shown in FIGS. 1 to 6. Therefore, like parts in all the views FIGS. 1 to 16 are designated by like reference numerals.

The base **10** of the bender shown in FIGS. 12 to 16 is fixedly mounted on the top of a rectangular frame **78** open at its top and bottom, and having, at least, one vertical side wall **80** and end walls **82**, the latter having flat portions **84** projecting outwardly from their bottom edges and having openings **86** through which screws may be inserted for attaching the bender to a table or bench.

Instead of a single lever stop pin **40** selectively insertable in the openings **38** in the base **10** at the lever stop positions in the lower horizontal surface **14**, as shown in FIG. 1, separate stop pins **88** having convex heads **90** at their lower ends are slidably inserted upwardly through the respective openings **38**, as shown in FIGS. 12 and 14. A fitting **92** inserted in a threaded opening in the base **10** has at its upper end a socket **94** in which the lower end of the bending lever pivot pin **22** is removably seated. The fitting **92** has a threaded reduced portion **96** at its lower end on which a circular angle indicator dial **98** of dish-like shape is mounted in an inverted position through a central opening **100** in the dial with its flat top surface **102** against a shoulder **97** formed by the reduced

portion **96** and held rotatably on said reduced portion in a horizontal position parallel with the base **10** by means of a nut **104**. In this position the convex ends **90** of the lever stop pins **88** are urged against the surface **102** of the dial **98** by means of compression springs **106** with the upper ends of all the lever stop pins flush with the lower surface **14** of the base **10** containing the openings **38** at which the angles of bend of the wire or flat stock are indicated by radial marks directed to alphabetical letters.

The lever stop pins **88** are selectively projected above the surface **14** for abutment by the bending lever **16** by means of a single cam element **108** formed with or mounted on the top wall surface **102** of the dial **98**, this cam having oppositely tapered end surfaces **110** for rotary insertion under the convex heads of the stop pins **88**. Upon withdrawal of the cams from either of the pins it will automatically be lowered to its inactive position by its associated spring **106**. The cam **108** has a central concave seat **112** into which the convex heads **90** of the pins **88** will snap when they reach the respective stop positions. The dial **98** has an outwardly beveled marginal portion **114** bearing alphabetical letters designating the various bending angles this portion being of a sufficient diameter to project outwardly through a rectangular opening **116** of the wall **80** for visibility. However, as shown in FIG. 12 the pins being actuated by the cam **108** are in annularly reverse relation with the alphabetical letters on the dial **98**, visible outside the opening **116** designating the actual positions of the lever stop pins **88** for effecting the angular bends indicated on the beveled marginal edge of the dial **98**. The peripheral edge of the dial **98** may be knurled as indicated at **118** for convenience in rotating the dial into the selective positions for actuating the lever stop pins **118**.

From the foregoing descriptions it will be seen that certain advantageous features of construction and operation for effecting and visually indicating the bending of the linear stock into various precise angles are common to all three forms of my improved bender illustrated in FIGS. 1 to 16, including (1) the cooperative relation of the horizontal width of the bending lever with the diameter of the lever stop pin or pins, (2) the seating of the lower edge of the bending lever on a lower surface of the base, so that the portion of the stock to remain unbent will be solidly supported by the higher surface of the base while leaving the portion to be bent above the lower surface for free abutment by the bending lever, (3) the cooperative relation of the vertical rectangular pivot pin and lever support as a positive stop for the bending lever in its starting position perpendicular to the elongated rectangular base, and (4) the cooperative relation of visual angle indicating letters or other characters with the lever stop pin or pins and a linear scale and adjustable length stop on the base in facilitating the programming of various uniform bends of either wire or flat linear stock.

Although some of the individual elements employed in my improved bender have been used in previous benders I believe I am the first to employ such elements in the cooperative and advantageous manner illustrated and described.

Since various changes or modifications in my improved bender may be made without departing from the spirit of my invention it should be understood that the embodiments of my invention shown are intended to be illustrative, only, and restrictive only by the appended claims.

I claim:

1. A bender for bending wire or flat linear stock to various predetermined angles, said bender comprising, in combination, an elongated base having a rearward top surface in one plane for supporting thereon the stock to be bent and a forward surface in a lower horizontal plane, a vertically elongated support of rectangular cross-sectional shape projecting upwardly from the forward end of said higher surface, a pivot pin mounted vertically on an inner side of said support with a space therebetween for close fitting relation with the stock to be bent, a bender lever having a vertical rectangular portion of substantial height and narrow width mounted on said pivot pin with its lower edge rotatably seated on said lower surface of the base, the forward side of said support serving as a stop for said bending lever when the latter is in its bend starting position in right-angular relation with said base in which position a front surface of said lever is in alignment with the inner surface of said support, a plurality of bending lever stop positions on said base with visual angle indicator means associated therewith, at least, one stop pin having means for fixedly holding it in a selected one of said stop positions for abutment by said lever, the precision of angle of the bend effected by the level being dependent on the cooperative relation of the width of the bending lever and the diameter of the stop pin.

2. A bender as in claim **1** in which the front end surface of the bending lever has therein a horizontal wire supporting groove with its lower edge in coincident alignment with the rearward higher surface of the base, and in which said vertical support has in its inner surface a wire supporting groove of corresponding size and in coincident alignment with the groove in the bending lever when the latter is in its bend starting position in right-angular relation with said base.

3. A bender as in claim **1** and including a longitudinally adjustable length stop for said linear stock associated with a linear scale on the lower surface of said base.

4. A bender as in claim **1** in which the means for holding a stop pin in a selected one of said stop positions include vertical openings in the base at the respective lever stop position in which said pin is inserted, and in which the visual angle indicator means consists of characters printed on the base opposite said openings.

5. A bender as in claim **1** in which the means for holding a stop pin in a selected one of said stop positions includes a protractor-like member detachably mounted on the top of the vertical support, said member having therein a circular slot in concentric relation with the pivot pin and in which a single stop pin inserted, means for adjustably clamping said pin at various angular positions in said slot, the visual angle indicator means consisting of characters printed on the surface of said protractor-like member.

6. A bender as in claim **2** in which a narrow space of substantial height is formed between the inner surface of the vertical support and the pivot pin for edgewise insertion therethrough of flat linear stock of various widths to be bent.

7. A bender as in claim **4** in which the base is mounted on a casing open at its top and bottom, a vertical wall of said casing having therein a lateral opening through which projects the outer marginal edge portion of a dial horizontally and rotatably mounted on a fitting depending from the base, the marginal portion bearing visual angle indicator characters corresponding to the angles of bend of the stock at said vertical openings in the base, a separate lever stop pin slidably mounted in each of said openings with its upper end flush with the top surface of the base, said pins all having headed, convex lower ends, compression springs mounted on said pins urging the lower ends against the horizontal surface of said dial, and a single inclined cam on said surface for selectively lifting said stop pins above the surface of said base for abutment by said bending lever.

8. A bender as in claim **7** in which the fitting on which the indicator dial is rotatably mounted has a socket in its upper end in which the lower end of the pivot pin is seated.

9. A bender as in claim **7** in which the pin actuating cam has a central concave seat into which the concave

heads of the bender stop pins will snap when the cam is rotated to the corresponding stop position.

References Cited

UNITED STATES PATENTS

1,020,582	3/1912	Straus	72—459
1,174,143	3/1916	Heinen	72—388
1,277,234	8/1918	McKenna	72—458
1,425,261	8/1922	Kardong	72—388
1,575,014	3/1926	Snell	72—459
1,889,239	11/1932	Crowley	72—35
2,371,695	3/1945	Landcaster	72—32
2,455,138	11/1948	Perkins	72—459
2,568,691	9/1951	Wildman	72—458

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G. P. CROSBY, Assistant Examiner

U.S. Cl. X.R.

72—32, 310, 459