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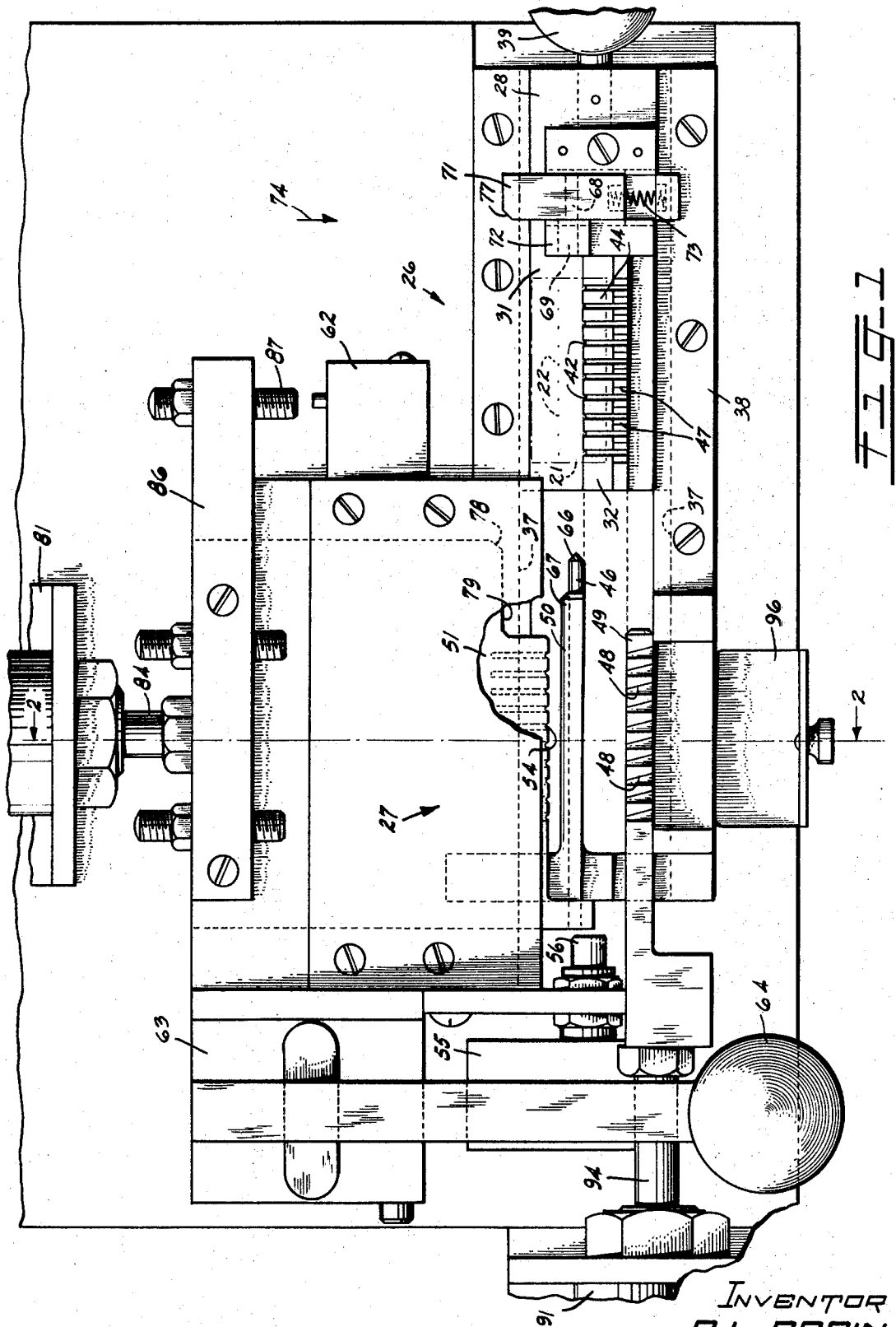
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3,519,033

APPARATUS FOR BENDING AND CUTTING AN ELONGATED ELEMENT

Filed June 4, 1968

6 Sheets-Sheet 1



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APPARATUS FOR BENDING AND CUTTING AN ELONGATED ELEMENT

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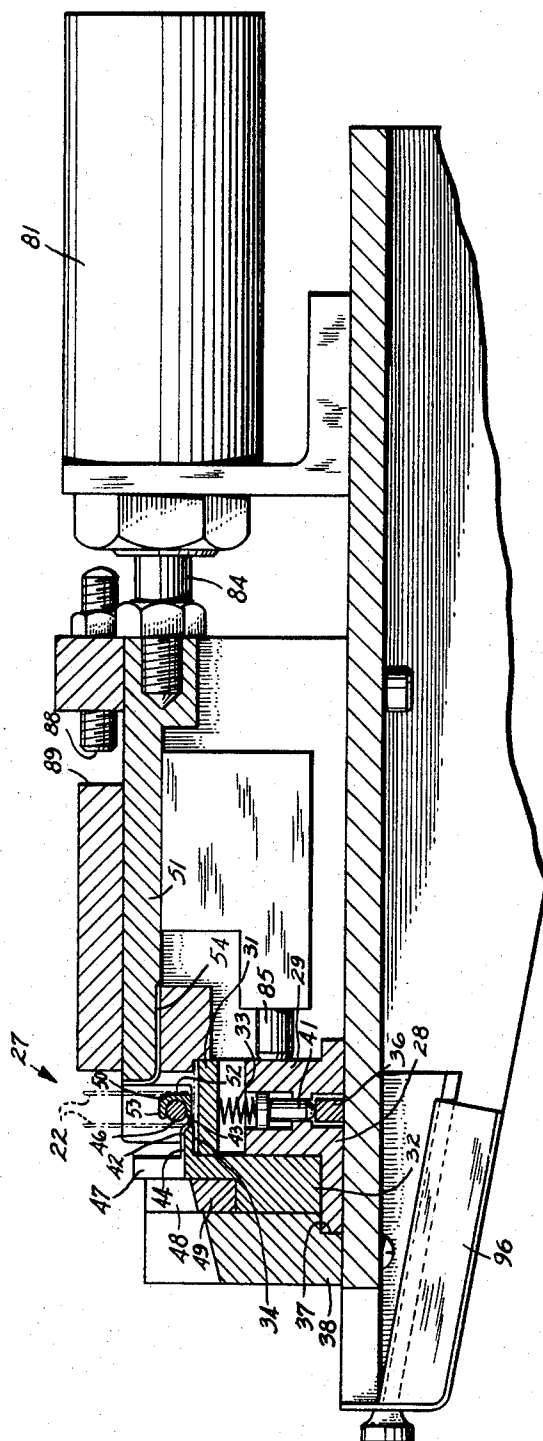


Fig. 2

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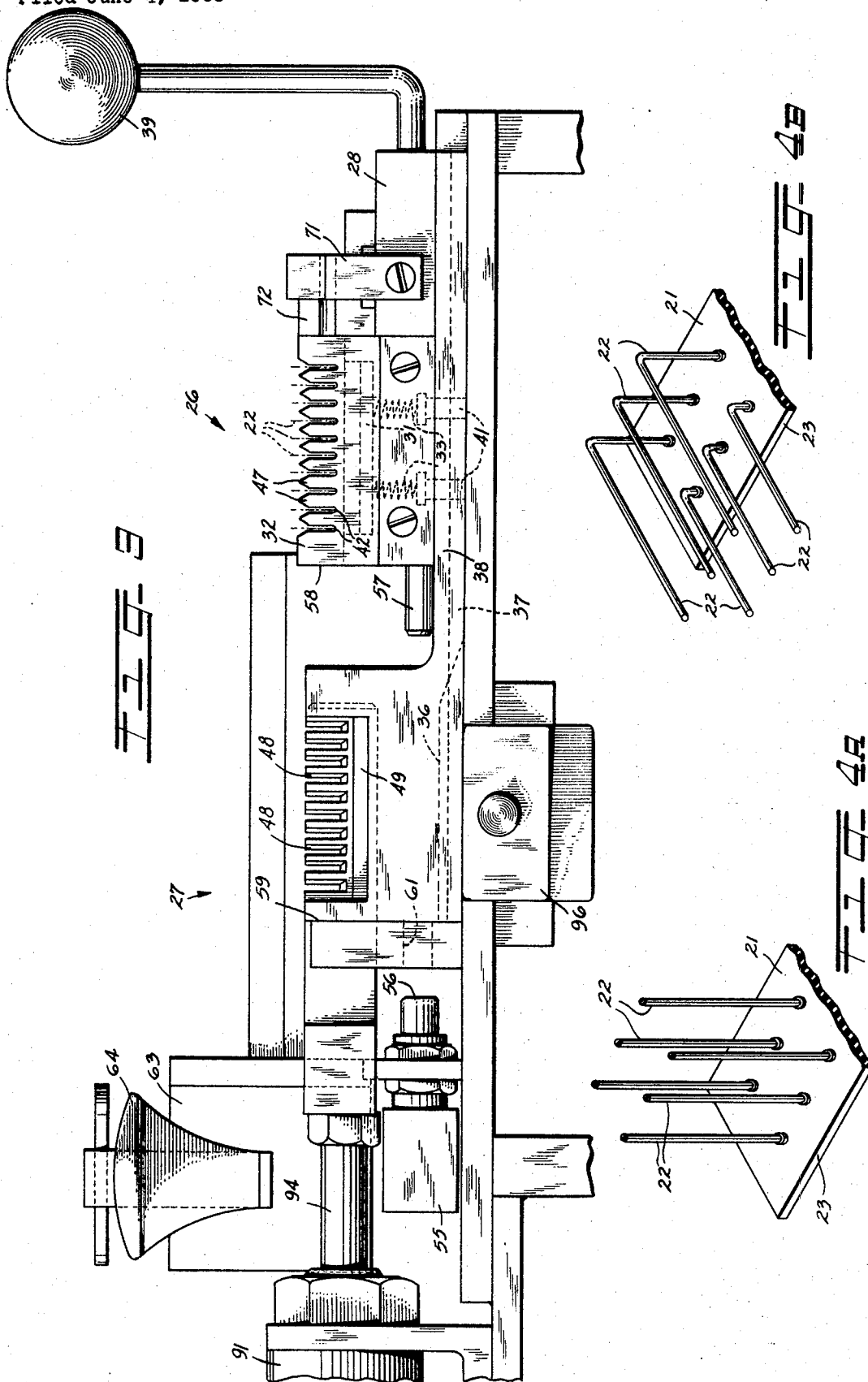
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APPARATUS FOR BENDING AND CUTTING AN ELONGATED ELEMENT

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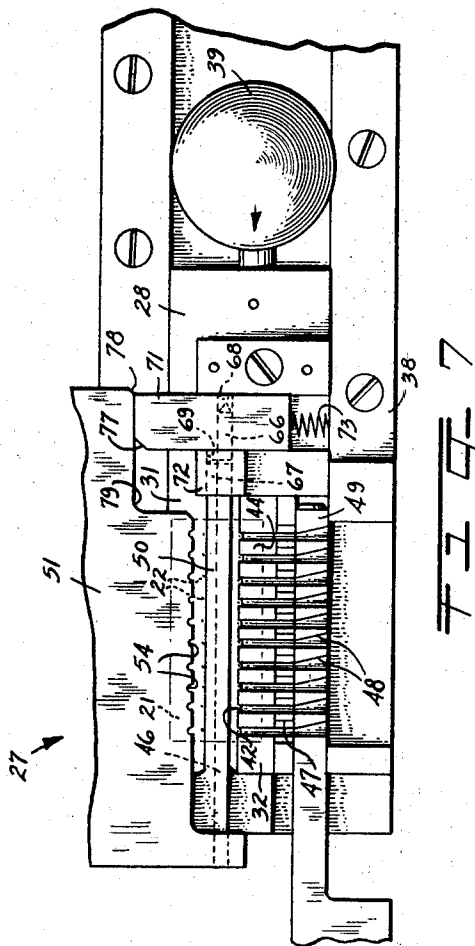
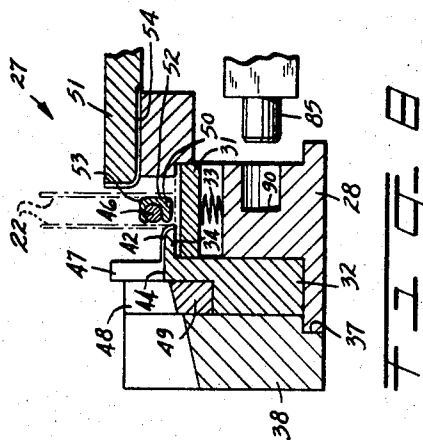
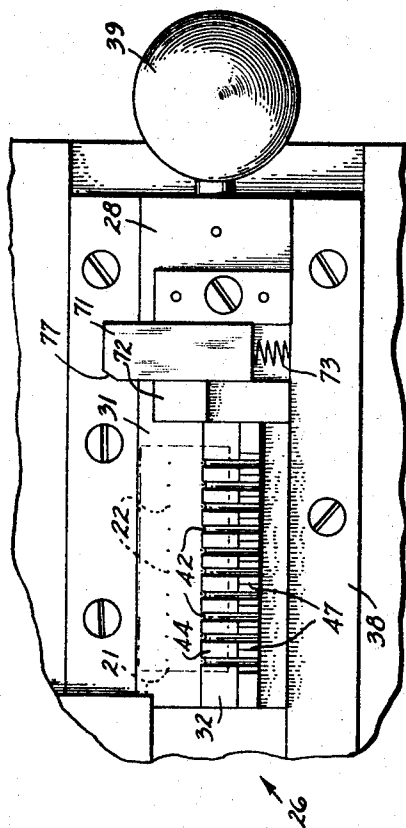
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APPARATUS FOR BENDING AND CUTTING AN ELONGATED ELEMENT

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FIG- 5



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APPARATUS FOR BENDING AND CUTTING AN ELONGATED ELEMENT

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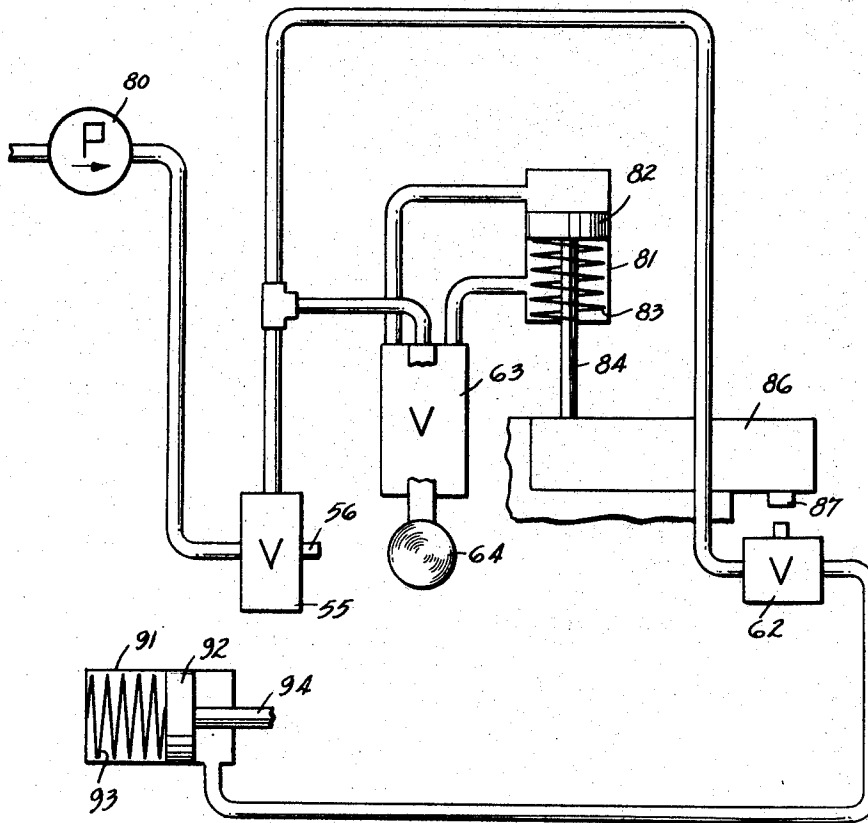


Fig. 13

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APPARATUS FOR BENDING AND CUTTING AN ELONGATED ELEMENT

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U.S. Cl. 140—1

15 Claims

ABSTRACT OF THE DISCLOSURE

A slide assembly mounts a base from which two rows of lead wires project. The slide assembly is moved manually into an operative position, where it opens a control valve to introduce pressurized fluid into a cylinder. A piston drives two bending members across upper and lower bending anvils to bend both rows of leads across the bending anvils and into receiving positions in a cutting mechanism. A cutting comb is then moved across a cutting anvil to cut off end parts of the bent wires in the receiving positions.

BACKGROUND OF THE INVENTION

This invention relates to apparatus for bending and cutting an elongated element and, more particularly, to apparatus for bending plural rows of elongated elements in a single direction and then cutting off ends of the bent portions of the elongated elements.

In the manufacture of certain articles, such as thin-film circuits, it is desired that elongated elements, such as lead wires which extend perpendicularly from the circuit in parallel rows, all be bent, one row over the other, into an L shaped configuration. The bent ends of the elongated elements must then be cut to a desired length.

It is desirable that apparatus be provided for producing a large number of finished articles in a relatively short period of time. Such apparatus should be relatively compact and simple in nature and should be easy to operate, yet must function reliably to manufacture articles of good quality. Thus, delicate lead wires extending from fragile thin-film circuits must be bent at desired longitudinal positions therealong to extend in a desired direction, and must then be cut to a desired length, all without any damage to the wires or the circuits and without any significant departure from predetermined design requirements for the position and direction of the bend, the straightness of the wires, and the length of the bent and cut lead wires.

SUMMARY OF THE INVENTION

An object of the invention resides in new and improved apparatus for bending and cutting an elongated element or elements, such as lead wires extending from a base or thin-film circuit.

The invention contemplates the provision of a bending mechanism and a cutting mechanism, the cutting mechanism having a cutting edge or edges positioned to receive adjacent thereto one or more bent ends of the wires upon completion of a bending stroke of the bending mechanism.

A first control mechanism is provided for actuating the bending mechanism to initiate the bending stroke only upon the wires being correctly aligned, prior to bending, with one or more receiving positions in the cutting mechanism. A second control mechanism is provided for actuating the cutting mechanism to initiate a cutting stroke only upon completion of the bending stroke. These two control mechanisms aid in assuring a correct alignment of the parts necessary for producing articles of good quality meeting predetermined design requirements.

The invention further contemplates the mounting of the base or thin-film circuit on an article support assembly movable into an aligned operating station. A mechanism is effective in the operating station to increase a clamping force applied to the base, so as to retain the base more firmly in the article support assembly during the critical bending and cutting operations. This further assures the good quality of the finished product.

The invention further contemplates the use of portions of the article support assembly to support part of the bending mechanism, thereby providing an efficient, compact, and reliable configuration for the apparatus.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a top view of an apparatus for bending and cutting elongated elements, the apparatus having been constructed in accordance with the principles of the invention;

FIG. 2 is an end elevational view of the apparatus, taken partially in section along the line 2—2 of FIG. 1, illustrating a pair of bending members, a pair of bending anvils, a cutting comb and a cutting anvil, all forming part of the apparatus;

FIG. 3 is a side elevational view of the apparatus, showing an article-carrying slide assembly in a loading station;

FIG. 4A is an isometric view of a portion of an article which includes leads to be bent and cut using the apparatus of FIGS. 1-3;

FIG. 4B is an isometric view of a portion of the article after bending and cutting of the leads;

FIGS. 5, 7, 9, and 11 are top views of a portion of the apparatus, depicting successive stages in the operation of the apparatus;

FIGS. 6, 8, 10, and 12 are cross-sectional views, looking from an end of the apparatus, further illustrating successive stages in the operation of the apparatus and corresponding, respectively, to FIGS. 5, 7, 9, and 11; and

FIG. 13 is a schematic diagram of a fluid circuit for controlling the operation of the apparatus of FIGS. 1-3 and 5-12.

DETAILED DESCRIPTION

Referring to FIG. 4B of the drawing, a portion of an article is illustrated. The article includes a flat plate or base 21, for example, a thin-film circuit, with a number of elongated elements 22, such as lead wires, projecting outwardly from one face of the base 21. The leads 22 are arrayed in two parallel rows of leads extending perpendicularly to the base. The leads are all bent in the same direction, so that the bent ends of the leads all extend outwardly over one edge 23 of the base 21 in an "L" shaped configuration. Each of the leads of one row has a bent end coplanar with and extending over the bent portion of one of the leads of the other row. Thus, the bends in the leads 22 of the upper row necessarily are located at a greater longitudinal distance on the leads from the base than are the bends in the leads of the lower row. All of the leads 22 in both rows are of a desired length, such that all of the leads terminate in a single plane which extends perpendicularly to the base 21.

Turning now to FIGS. 1-3 and 5-12, an apparatus for producing the article of FIG. 4B is shown. The apparatus includes a loading station 26 (FIGS. 1, 3, 5, and 6) and a bending and cutting station 27 (FIGS. 1-3 and 7-12). Unfinished articles, having two rows of unbent leads 22 extending perpendicularly to base 21 as shown in FIG. 4A, are to be transported horizontally between the loading station 26 and the bending and cutting station on a slide assembly or article carrier 28.

The slide assembly 28 (FIG. 6) is composed of three major elements, which are base 29 and a pair of clamp-

ing members 31 and 32. With the slide assembly 28 in the loading station 26, as shown in FIGS. 5 and 6, the base 21 of an unfinished article is to be inserted between the clamping members 31 and 32 with the leads 22 extending upwardly. Two springs 33 (FIGS. 3 and 6) are located beneath the clamping member 31 so as to bias the clamping member 31 upwardly toward a flange 34 on the clamping member 32 for retaining the base 21 therebetween supported and held on the clamping member 31.

A camming bar 36 (FIGS. 2 and 3) extends from the bending and cutting station 27 toward the loading station 26. The slide assembly or article carrier 28 is mounted for horizontal movement between the stations 26 and 27 by displacement along a guideway 37 in a frame member 38. The slide assembly may be moved, for example, by maneuvering a handle 39. Two cam followers 41 are mounted for vertical movement in the base 29 in horizontal alignment with the camming bar 36. The cam followers 41 bear against the bottom of the springs 33. The guideway 37 (FIG. 2) restrains the base 28 against vertical movement. Thus, the springs 33 will be further compressed when the slide assembly 28 is moved toward the bending and cutting station 27 and the cam followers ride up on the camming bar 36. Due to the increased compression in the springs, the base 21 will be more firmly retained between the clamping members 31 and 32 in station 27 during subsequent bending and cutting operations, so as not to be upset by forces applied to the leads 22 during these critical operations.

The clamping member 32 is shaped at an upper end thereof to form both a lower bending anvil and a cutting anvil. Thus, a plurality of channels or recesses 42 extend along a side surface 43 and an upper surface 44 of the member 32. The recesses 42 are positioned to receive a first row of the leads 22 extending from a base 21 in the portions of the recesses extending along the side surface 43. The clamping member 32 will act as a lower bending anvil providing side and upper surfaces against which a cantilevered bending rod 46, located at the bending and cutting station 27, will bend the leads 22 of the first row. The leads will be guided by the edges of the recesses 42 during bending, so that bent portions of the leads will be disposed within the portions of the recesses 42 extending along the upper surface 44.

A plurality of cutting anvil teeth 47 extend upwardly at the top of the clamping member 32, each anvil tooth having a cutting edge lying adjacent a recess 42 along a part of the upper surface 44 remote from the side surface 43. Thus, when the leads 22 are bent with the article correctly positioned in the station 27, the leads of the first row will have bent ends thereof extending into receiving positions between the cutting anvil teeth 47 and adjacent the cutting edges thereof. The bent ends are to be cut to the desired length by a set of cooperative cutting edges 48 on a cutting comb 49 located at the bending and cutting station 27. The desired lengths are fixed by the position of the cutting anvil teeth 47 and the cutting comb 49 relative to the mounting positions of the base 21 in the slide assembly 28.

Also located at the bending and cutting station 27 are an upper bending anvil 50 and a bending bar 51. As may be seen in FIG. 1, the bending bar 51 supports one end of the cantilevered bending rod 46 to drive the rod with movement of the bar. Movement of the slide assembly 28 along the guideway 37 and into the station 27 will position the leads 22 of the second row between the bending bar 51 and a side surface 52 of the upper bending anvil 50, adjacent an upper surface 53 of the upper bending anvil 50 (FIGS. 2 and 8). The bending bar 51 has a plurality of recesses 54, corresponding to the recesses 42 in the lower bending anvil or clamping member 32, extending over side and bottom surfaces thereof. The recesses 54 are positioned so that each will engage a lead 22 in the second row of leads and guide the engaged lead during bending there-

of over the upper surface 53 of the upper bending anvil 50. This will assure that, assuming a correct initial positioning of the leads 22, the bending operation will direct the leads of the second row into receiving positions in the cutting mechanism above the receiving positions for the leads of the first row. Thus, the bending operation will position the bent ends of all the leads 22 in parallel planes which include a number of receiving positions, each receiving position being located between the cutting edge of one of the cutting anvil teeth 47 and a cooperative cutting edge 48 of the cutting comb 49.

The foregoing discussion assumes that the article will be correctly positioned in the bending and cutting station 27. In order that bending and cutting strokes of the apparatus will occur only when the article is so positioned, i.e., with the leads 22 and the recesses 42 exactly aligned with the recesses 54 and the receiving positions between the cutting edges of the cutting anvil teeth 47 and the cooperative cutting edges 48 of the cutting comb 49, a control mechanism is provided by a bending control valve 55 (FIG. 13) in a fluid circuit for operating the apparatus. As is best seen in FIG. 3, a plunger 56 for opening the bending control valve 55 is aligned with an actuating rod 57 on the slide assembly 28. The length and position of the actuating rod 57 are selected to open the bending valve 55 only when an end wall 58 of the slide assembly 28 abuts a limiting wall 59 of the frame 38 at the bending and cutting station 27. The walls 58 and 59 are so positioned that when such abutment occurs, the respective recesses and receiving positions will be in the desired alignment. An aperture 61 through the limiting wall 59 provides a path for communication between the actuating rod 57 and the plunger 56.

In describing the operation of the apparatus, reference is first made to FIGS. 1, 3, 5, 6, and 13. The fluid circuit of FIG. 13 includes the bending control valve 55 (FIGS. 1 and 3), a cutting control valve 62 (FIG. 1) and a master control valve 63 (FIGS. 1 and 3). The master control valve 63 may, for example, be operated manually through manipulation of a handle 64. The handle 64 is biased away from a position for opening the master control valve 63. Initially, all three control valves 55, 62, and 63 are in a closed condition, into which they are spring biased. Additionally, the slide assembly or article carrier 28 is in the loading station 26.

The base 21 of a thin-film circuit (FIG. 4A) is now inserted, for example manually, toward the clamping member 32 (FIGS. 1, 5, and 6) and downwardly between the clamping member 31 and the flange 34 of the clamping member 32. The base 21 is manipulated until the leads 22 extend upwardly within the recesses 42 and abutting the side surface 43 of the clamping member 32. This provides a proper alignment position of the base 21 in the slide assembly 28. The springs 33 may be easily compressed to permit insertion of the base, since the cam followers 41 are not now engaging the lift surface of the camming bar 36. Spring force in the springs 33 is, however, sufficient to retain the base 21 between the clamping members until the cam followers ride up on the camming bar to clamp the base more firmly during the bending and cutting operations at station 27.

The slide assembly 28 is now moved along the guideway 37 toward the bending and cutting station 27, for example, by the right hand of an operator pushing on the handle 39. The cam followers ride up on the camming bar 36 (FIGS. 2 and 3) to compress the springs 33 and apply an additional clamping force to the base 21. As the slide assembly 28 enters the station 27, respective free ends 66 and 67 of the cantilevered bending rod 46 and the upper bending anvil 50 are engaged and supported in suitably placed and shaped apertures 68 and 69 in first and second support members 71 and 72, as may be seen by comparing FIGS. 5 and 7. The support member 71 is mounted for movement, against the bias of a spring 73, in a bending direction shown by the arrows 74 in FIGS.

1 and 9. It may be noted (FIGS. 1, 2, 7 and 8) that the bending rod 46 is normally housed or nested in an open ended cavity 76 (identified in FIGS. 10 and 12) in the upper bending anvil 50. This not only provides a compact overall structure, but also facilitates entry of the free ends 66 and 67 of the two members 46 and 50 into the aligned apertures 68 and 69. Also facilitating such entry is the presence of a pair of cooperative camming surfaces 77 and 78 on an edge of the movable first support member 71 and on an edge of a recessed surface 79 of the bending bar 51, respectively. As may be seen by comparing FIGS. 1 and 7, the camming surfaces 77 and 78 are positioned to correct any slight misalignment of the movable support member 71 so that the aperture 68 will be aligned correctly with the free end 66 of the bending rod 46. The spring 73, which normally holds the support member 71 biased against a stop (not shown) on the slide assembly 28, will hold the support member 71 in engagement with the recessed surface 79 of the bending bar 52 as the slide assembly enters the bending and cutting stations 27.

Movement of the slide assembly 28 continues until the end wall 58 of the slide assembly contacts the wall 59 of the frame 38. Simultaneously, the actuating rod 57 pushes on the plunger 56 and opens the bending control valve 55, indicating that the leads 22 are properly positioned at the bending and cutting station 27 (FIGS. 7 and 8). The opening of valve 55 fluid connects a source of fluid pressure, for example, a pneumatic compressor or pump 80 (FIG. 13), to the valves 62 and 63, both of which are still closed.

The handle 64 is now moved, for example, by the left hand of the operator, to open the master control valve 63. Pressurized fluid is thereby introduced into a cylinder 81 (FIGS. 1, 2, and 13) so as to advance a piston 82 against the bias of a spring 83. A push rod 84 connects the piston 82 to the bending bar 51, to which the bending rod 46 is fixed. A bending stroke occurs as both of these bending members are displaced in the bending direction, shown by the arrow 74 (FIG. 1), toward the upper and lower bending anvils 50 and 32, respectively. Thus, as seen in FIGS. 9 and 10 the leads are bent over the side surfaces 52 and 43 and across the upper surfaces 53 and 44 of the bending anvils 50 and 32 by the bending members 51 and 46, respectively, the bending occurring along the recesses 54 or 42. The walls bounding the recesses 54 and 42 act as guideways for the leads as they are bent. Thus, the leads 22 are bent in the bending direction along parallel bending planes, one over another in each of the bending planes. Each pair of leads in each bending plane is bent into a receiving position between the cutting edge of a cutting anvil tooth 47 on one side of the bending plane and a cooperative cutting edge 48 of the cutting comb 49 on the other side of the bending plane. As may be noted in FIG. 9, the support member 71 is driven during the bending stroke by the recessed surface 79 on the bending bar 51 so as to move with the bending rod 46 in the bending direction while continuously supporting the free end 66 of the bending rod. The support member 72, meanwhile, holds the free end 67 of the upper bending anvil 50 fixed against movement.

Also advanced by movement of the push rod 84 are a pin 85 (FIG. 2) and a bracket 86 (FIG. 1). The bracket 86 carries an actuating pin 87 for opening the cutting control valve 62 simultaneously with completion of the bending stroke of the bending bar 51 and the bending rod 46. The bending stroke terminates when a projection 88 (FIG. 2) carried by the bending bar 51 engages a stationary stop surface 89 on the frame of the apparatus. Meanwhile, the pin 85 enters a recess 90 (FIG. 10) in the base 29 of the slide assembly 28 for further alignment of the parts and to keep the apparatus in aligned condition during cutting of the leads.

The opening of the cutting control valve 62 supplies pressurized fluid to a cylinder 91 (FIGS. 1, 3, and 13) to

advance a piston 92 against the bias of spring 93. A piston rod 94 is connected between the piston 92 and the cutting comb 49 to cause a cutting stroke of the cutting comb with the advance of the piston 92. Thus, the cutting edges 48 of the cutting comb 49 (FIGS. 11 and 12) are moved across the parallel bending planes and over the cutting edges of the cutting anvil teeth 47 to cut the bent ends of the leads to the desired length. A removable tray 96 is positioned beneath the cutting mechanism to receive the severed portions of the leads.

The handle 64 may now be released, closing the master control valve 63 and cutting off the cylinder 81 from the supply of pressurized air. The biasing spring 83, thus, returns the bending members 46 and 51 and the actuating pin 87 on bracket 86 to their initial positions and withdraws the pin 85 from the recess 90. The cutting control valve 62 recloses upon withdrawal of the actuating pin 87. The closing of the valve 62 cuts off the supply of pressurized air to the cylinder 91. The spring 93, therefore, moves the cutting comb 49 back to its initial position.

The handle 39 may now be moved to return the sliding bracket 28 to the loading station 26. A finished article, similar to that depicted in FIG. 4, may then be removed from between the clamping members 31 and 32 upon compression of the spring 33.

The bending control valve 55, meanwhile, has closed upon withdrawal of the actuating rod 57 from the plunger 56. The apparatus is now in its initial condition. A new base 21 may be inserted into the slide assembly 28 and a new cycle of operations may be initiated.

It is to be understood that the above-described apparatus is simply illustrative of one embodiment of the invention. In another embodiment, a source of reduced fluid pressure, such as a vacuum pump could supply motive power to the apparatus. Alternately, electric motors or solenoids could be employed for displacing the rods 84 and 94, which operate the movable bending and cutting members, respectively, with switches replacing the control valves 55, 62, and 63. Additionally, three or more rows of leads could be bent by providing one or more bending members and bending anvil members with an appropriate number of suitably positioned bending and anvil surfaces. Many other modifications may be made without departing from the invention.

What is claimed is:

1. In apparatus for bending and cutting an elongated element:

means selectively movable into a predetermined position for supporting the elongated element;

means movable in a bending direction and engageable with the elongated element when said supporting means is in the predetermined position for bending the element in said bending direction;

means adjacent said bending means located to receive the bent portion of said elongated element for cutting the received bent portion; and

means rendered effective by said supporting means moving into said predetermined position for moving said bending means to bend the elongated element.

2. In apparatus for bending and cutting an elongated element, as set forth in claim 1:

means rendered effective upon movement of said bending means to bend the element for actuating said cutting means to cut the bent element.

3. In apparatus for bending and cutting an elongated element:

means for supporting the elongated element extending in an outward direction therefrom;

means for bending the supported elongated element in a bending direction transverse to said outward direction, the bending direction and the outward direction defining a plane of bending for the elongated element; a fixed cutting edge mounted to one side of said plane of bending and in said bending direction from the

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bending means to receive a bent end of the elongated element adjacent to said fixed cutting edge; and

a movable cutting edge mounted for displacement across said plane of bending and toward and across said fixed cutting edge from a normal position of said movable cutting edge at the other side of the plane of bending from the fixed cutting edge and in said bending direction from the bending means so as to sever the bent end of the elongated element received adjacent the fixed cutting edge.

4. In an apparatus for bending and severing an article; a cantilever mounted bending element;

a work support holding said article;

carrier means mounting said work support for movement parallel too said bending element to position the article adjacent to said bending element;

means on said carrier means for receiving and supporting the free end of said cantilever bending element upon advance of said carrier means;

a first cutter means on said carrier means;

a second cutter means positioned adjacent said cantilever bending element;

means operative following advance of said carrier means for bending said article about said bending element into a position between said first and second cutter means; and

means for moving said first and second cutter means relative to each other to sever a bent section of said article.

5. In apparatus for bending first and second parallel elongated elements one over the other in the same direction along a line therebetween and then cutting the bent portions of the elements;

means selectively movable into a predetermined position for supporting the elongated elements;

means movable in said direction along said line between the elongated elements and engageable with the first elongated element at a first longitudinal position therealong and with the second elongated element at a second and different longitudinal position therealong when said supporting means is in the predetermined position for bending the element one over the other in said bending direction;

means adjacent said bending means located to receive the bent portions of both of said elongated elements for cutting the received bent portions; and

means rendered effective by said supporting means moving into said predetermined position for moving said bending means to bend the elongated elements.

6. In apparatus for bending and cutting first and second elongated elements, as set forth in claim 5:

means rendered effective by movement of said bending means to bend portions of the elements into receiving positions in said cutting means for actuating said cutting means to cut said portions of the elements.

7. In apparatus operable upon first and second parallel elongated elements which extend in an outward direction from one face of an article for bending the elements one over the other in a bending plane defined by the elements and then cutting the elements:

means for supporting the article;

a first bending anvil having adjacent first and second surfaces extending transversely to said bending plane, said first surface extending along said outward direction and intersecting said bending plane extending adjacent a first side of the first elongated element, said second surface intersecting said bending plane along a first line extending in a bending direction transverse to said outward direction;

a second bending anvil having corresponding adjacent first and second surfaces extending transversely to said bending plane, said first surface of the second bending anvil extending along said outward direction and intersecting said bending plane extending adjacent a corresponding first side of the second

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elongated element, said second surface of the second bending anvil intersecting said bending plane along a second line extending in said bending direction parallel to and spaced from said first line;

bending means intersecting said bending plane and displaceable in said bending direction from a position adjacent second sides of the first and second elongated elements opposite said first sides to pass across said second surfaces of the bending anvils for bending the elongated elements one over the other in said bending plane along said first and second lines extending in said bending directions; and

cutting edge means normally located externally of said bending plane adjacent said first and second bending anvils generally in said bending direction therefrom and displaceable across said first and second lines for receiving bent portions of both of the elongated elements adjacent to said normal location and cutting the received bent portions upon said displacement.

8. In apparatus operable upon first and second elongated elements, as set forth in claim 7, wherein said article supporting means includes means for moving said article to align the elongated elements with receiving positions in said bending plane and adjacent said cutting edge means prior to bending of the elongated elements, and further including:

means rendered effective by alignment of the elongated elements with said receiving positions for moving said displaceable bending means in said bending direction to bend the elongated elements into said receiving positions adjacent said cutting edge means.

9. In apparatus operable upon first and second elongated elements, as set forth in claim 8:

means rendered effective by movement of said displaceable bending means to bend the elongated elements into said receiving positions for moving said displaceable cutting edge means across said first and second lines to cut the received bent portions of the elongated elements.

10. In apparatus operable upon first and second elongated elements, as set forth in claim 7, wherein:

one of said bending anvils includes an open ended cavity therein; and

a part of said displaceable bending means is nested within said cavity in a normal, undisplaced position of said bending means.

11. In apparatus operable upon first and second elongated elements, as set forth in claim 10:

said article supporting means including an article carrier movable into a bending station;

said one bending anvil and said part of said displaceable bending means each having a free end projecting toward said article carrier prior to movement of said article carrier into said bending station;

said article carrier including a first member movable in said bending direction and having a portion thereof shaped and positioned to engage and support the free end of said part of said displaceable bending means when said article carrier is moved into said bending station;

said article carrier also including a second member fixed against movement in said bending direction and having a portion thereof shaped and positioned to engage and support the free end of said one bending anvil when said article carrier is moved into said bending station; and

means for moving said article carrier into said bending station.

12. In apparatus operable upon first and second elongated elements, as set forth in claim 7:

said article supporting means including first and second clamping members for gripping an article therebetween and also including a spring biasing said sec-

ond clamping member in a clamping direction toward said first clamping member;
 means for displacing said clamping members transversely of said clamping direction between first and second positions of the clamping members;
 a cam follower engaging a portion of said spring remote from said second clamping member and movable with the clamping members between said positions; and
 clamping means extending from said second position of the clamping members toward said first position and aligned to engage said cam follower for moving said cam follower in said clamping direction to compress said spring and further bias said second clamping member toward said first clamping member in said second position of the clamping members.

13. In apparatus for bending and cutting wires extending generally perpendicularly to a base parallel first and second rows of wires:
 a displaceable support for the base;
 means for moving said support from a first station into a second station;
 a first bending anvil mounted on said support in position to engage a first side of the first row of wires extending from the flat base and movable with said support into said second station;
 a second bending anvil mounted at said second station in position to engage a corresponding first side of the second row of wires extending from the flat base with said support in said second station;
 a first bending member mounted at said second station in position to engage a second side of the first row of wires opposite to said first side and movable toward and across said first bending anvil when in said second station to bend the wires of said first row across said first bending anvil;
 a second bending member mounted at said second station in position to engage a second side of the second row of wires opposite to said first side with said support in said second station and movable toward and across said second bending anvil to bend the wires of said second row across said second bending anvil;
 a cutting anvil mounted on said support for movement therewith into said second station and having a plu-

ality of cutting edges for receiving adjacent thereto the bent wires of said first and second rows;
 a cutting comb mounted at said second station and having a plurality of cutting edges movable across said cutting edges of said cutting anvil in said second station to sever the bent wires received therebetween;
 guide means effective during bending for directing the bent portions of the leads of both rows into receiving positions adjacent said cutting edges of said cutting anvil;
 control means engaged by the support in said second station; and
 means responsive to engagement of said control means for moving said first and second bending members toward and across said first and second bending anvils, respectively.

14. In apparatus for bending and cutting wires, as set forth in claim 13:
 means responsive to said first and second bending members across said first and second bending anvils for moving the cutting edges of said cutting comb across the cutting edges of said cutting anvil.

15. In apparatus for bending and cutting wires, as set forth in claim 13:
 said displaceable support including means for applying a clamping force to the base on said support in said first station; and
 means extending from said second station toward said first station for increasing said clamping force applied to the base in said second station as the support is moved into said second station.

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LOWELL A. LARSON, Primary Examiner

U.S. CI. X.R.

72—338, 384; 140—71

UNITED STATES PATENT OFFICE CERTIFICATE OF CORRECTION

Patent No. 3,519,033 Dated July 7, 1970

Inventor(s) ALBERT L. PEPIN

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 6, line 35 "alternately" should be --alternatively--
Spec., pg. 13, line 12.
Col. 7, line 15 "too" should be --to-- Spec. pg. 16,
line 6.
Col. 9, line 18, after "base" insert --in--
Spec. pg., 24, line 2.
Col. 10, line 20, after "bers" insert --moving--
Spec. pg. 26, line 4.

Signed and sealed this 29th day of June 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents