Jan. 17, 1961 T. WOLF 2,968,323

BENDING CHISEL HEAD FOR A COIL BENDING MACHINE

Filed Jan. 24, 1955 3 Sheets-Sheet 1

Fig. 1.

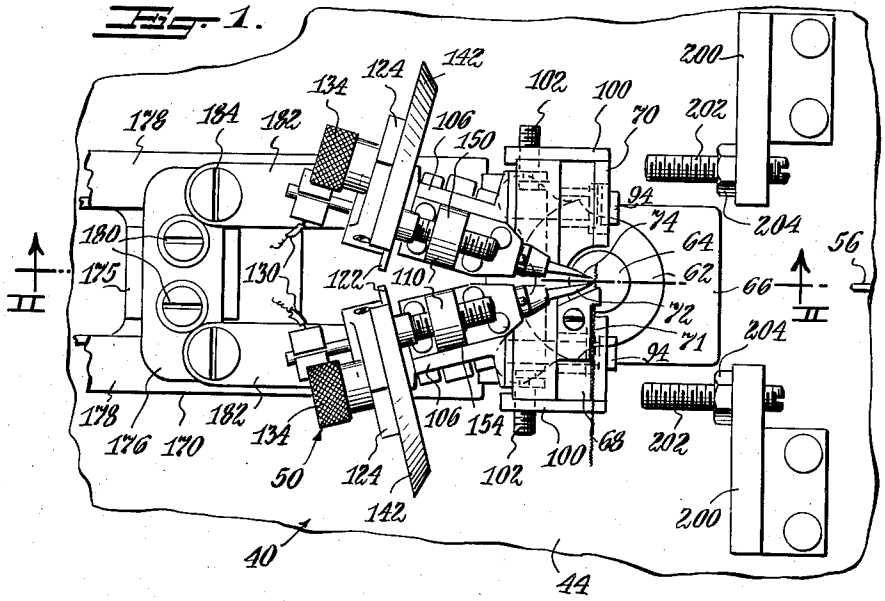

Fig. 2.

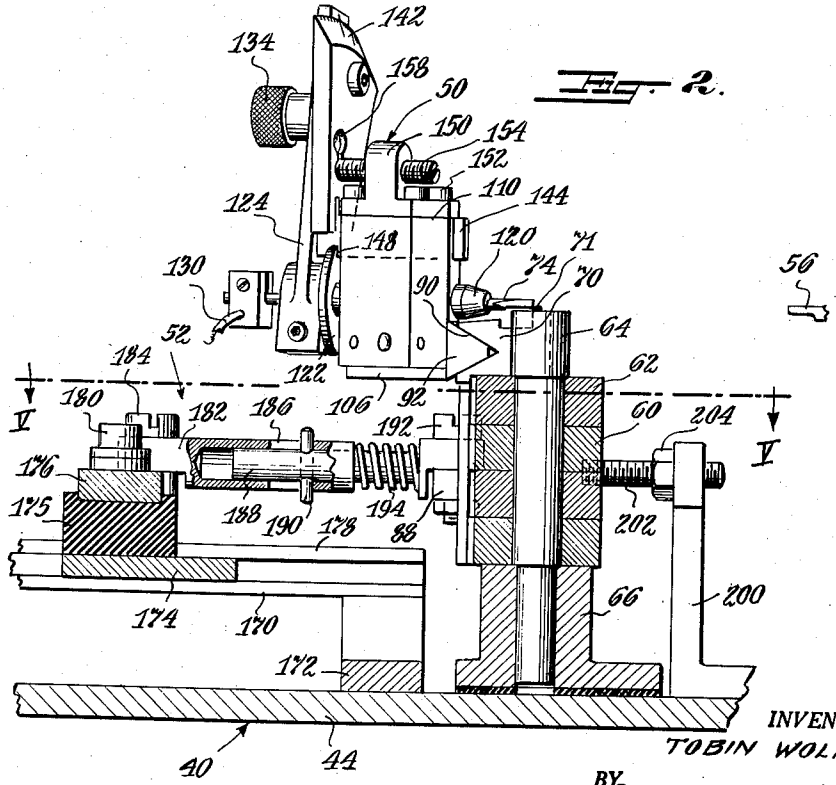

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Fig. 3.

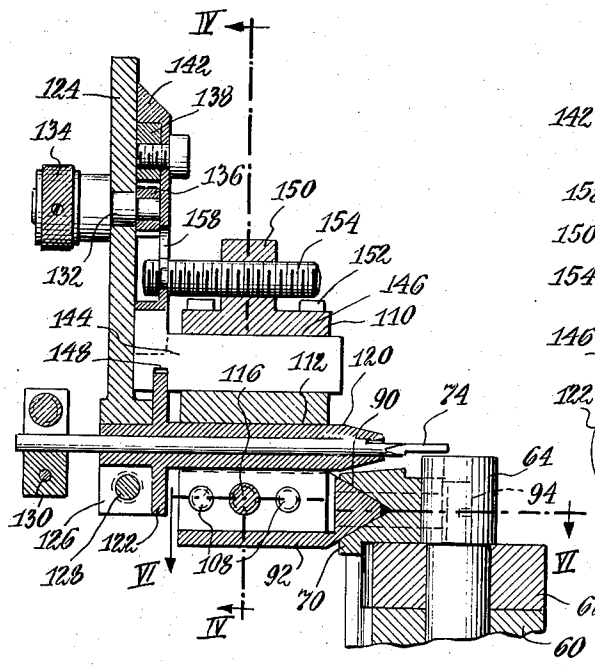


Fig. 4.

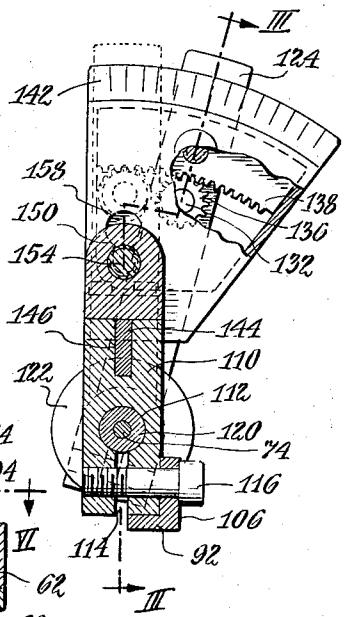
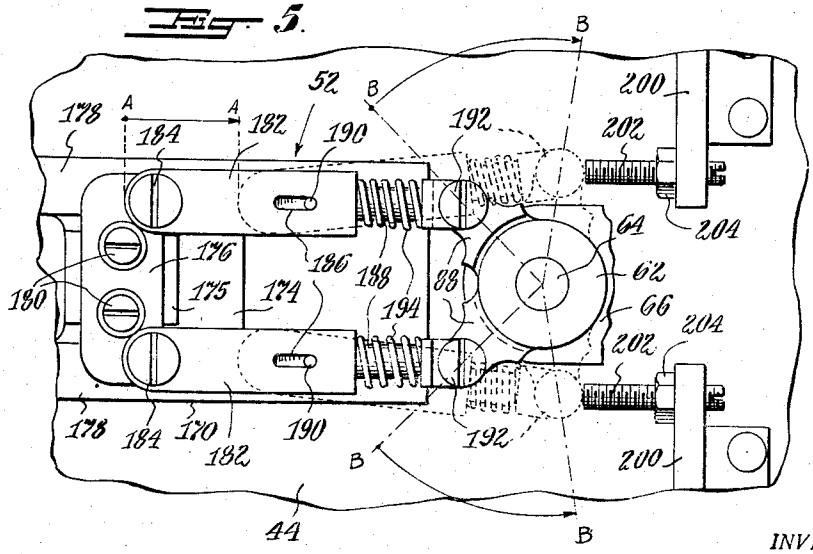


Fig. 5.



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BENDING CHISEL HEAD FOR A COIL BENDING MACHINE

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Fig. 6.

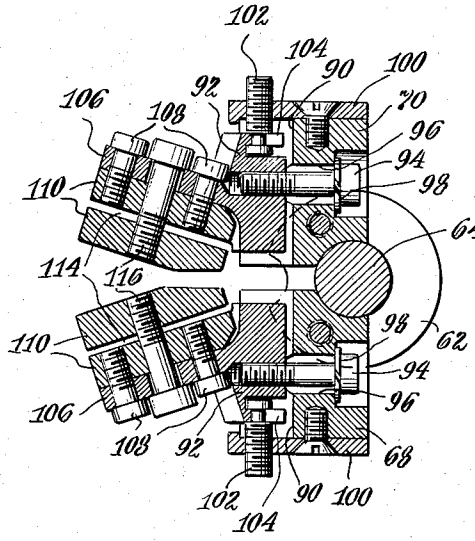


Fig. 9.

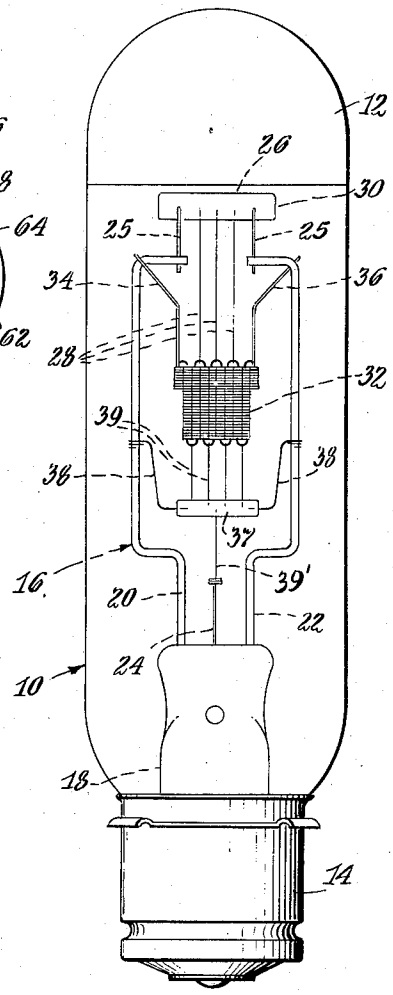


Fig. 7.

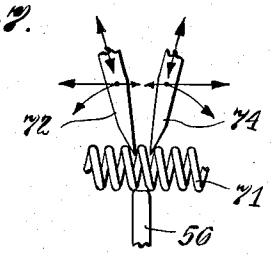
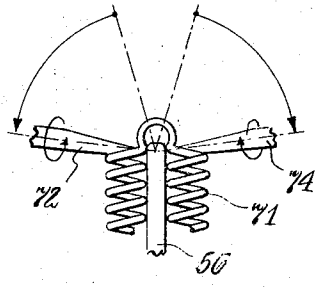


Fig. 8.



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United States Patent Office 2,968,323 Patented Jan. 17, 1961

2,968,323

BENDING CHISEL HEAD FOR A COIL BENDING MACHINE

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Filed Jan. 24, 1955, Ser. No. 483,618

6 Claims. (Cl. 140—71.5)

This invention relates to a coil bending machine for projection lamp filaments and, more particularly to a bending chisel head for such a machine.

A conventional filament for an incandescent electric lamp, such as a projection lamp, may be formed from a continuous coil into a monoplane or a bi-plane plural section filamentary device. The plural sections, ten for example of the bi-plane filament may comprise a first and last section for mounting legs, a second, third, eighth and ninth sections as outer sections and the remaining four sections as inner or center sections.

The purpose of this invention is to provide an improved bending chisel head for a coil bending machine for producing a bend in a continuously wound coil. Each bend is formed of one turn of the coil at a predetermined distance or number of turns from a desired point on the coil. The bending operation in the ten section example cited is performed nine times at desired predetermined intervals. All ten sections of the above mentioned lamp filament are alternately staggered and shows a series of five loops on one side and a series of four loops on the other side. The filament coil sections are arranged in a double vertical plane (bi-plane) so that the coils in the one row fill in the spaces between the sections of the other row. This arrangement produces greater uniformity and higher average brightness than the single row monoplane type filament.

A coil bending machine of the prior art is exemplified in U.S. Patent Number 2,693,204, filed May 29, 1952 by Arno Greiner et al., assigned to the assignee of the subject application and entitled "Coil Bending Machine for Projection Lamp Filaments."

It has been found desirable to provide such an existing coil bending machine first, with mechanisms for accurately controlling or positioning the bending chisels and secondly to insure that each movement or positioning of the bending chisels in a required direction does not effect any other positioning requirement. It has been found desirable according to the invention to accurately position the bending chisels in four directions and to insure that all positioning movements will be independent.

It is desirable to accurately position and control the movement of the bending chisels with respect to the continuous coil undergoing bending and the bending blade which is moved against two predetermined turns of a continuous coil. First, it is desirable to accurately rotate and position the screw driver-like operating end of the bending chisels so that said operating end is positioned at an angle corresponding to the helix angle of the continuous coil. Secondly, in order that the bending chisels will straddle one predetermined turn of the continuous coil (and not hit successive turns) it is also desirable to provide accurate positioning of the bending chisels in a direction parallel to the longitudinal axis of the unbent continuous coil. Thirdly, it is equally desirable to insert the operating ends of the bending chisel a predetermined amount into the barrel or body of the continuous coil. For this purpose the bending chisel

must be accurately positioned along its own longitudinal axis. Finally the total amount of bending of the continuous coil is determined by the total arc or angular swing through which the bending chisels are swung or rotated. The total arc of bending chisel travel must be accurately controlled to provide acceptable uniformly bent sections.

In its general aspect the present invention has as its objective an improved bending chisel head for a projection lamp coil bending machine.

An additional object is an improved bending chisel head in which the positioning of each bending chisel (firstly) longitudinally along its own axis (secondly) rotatably about its own axis and (thirdly) laterally with respect to each other and parallel to the longitudinal axis of the unbent coil is achieved independently of each other and without disturbing each other.

A further object is an improved bending chisel head in which the swing of the bending chisels during the bending operation, can be accurately controlled and the final position of the chisels definitely limited.

A further object is an improved chisel head for a coil bending machine wherein each of the bending chisels may be positioned (independently of the other bending chisel) in a direction longitudinal of its own axis, rotatably about its own longitudinal axis, and laterally with respect to the other chisel and parallel to the longitudinal axis of the unbent coil.

A still further object is a bending chisel operating mechanism having independent control of the total arc swing of each bending chisel.

Referring now to the drawings in which like numerals of reference indicate similar parts throughout the several views:

Fig. 1 is a plan elevational view of the improved bending chisel head of the invention for a projection lamp coil bending machine.

Fig. 2 is a side elevational view of the coil bending head of Fig. 1 along the line II—II of Fig. 1 in the direction of the arrows and showing more clearly the controlling and positioning mechanism for one bending chisel of said bending head.

Fig. 3 is a vertical sectional view of the bending chisel head along the line III—III of Fig. 4 in the direction of the arrows and showing particularly the mechanism for controlling the longitudinal movement of a bending chisel along its longitudinal axis, the mechanism for rotating a bending chisel about its longitudinal axis and the mechanism for moving a bending chisel laterally with respect to the longitudinal axis of the unbent coil.

Fig. 4 is a vertical sectional view along the line IV—IV of Fig. 3 in the direction of the arrows and showing particularly the bending chisel rotating mechanism.

Fig. 5 is a horizontal sectional view of the bending chisel head along the line V—V of Fig. 2 in the direction of the arrows and showing more particularly the bending chisel swinging mechanism for controlling the total arc of the bending chisels.

Fig. 6 is a horizontal sectional view of the bending chisel head along the line VI—VI of Fig. 3 in the direction of the arrows and showing the mechanism for laterally positioning the bending chisels with respect to each other and parallel to the longitudinal axis of a continuous coil undergoing bending.

Fig. 7 is a plan diagrammatic view of the bending chisels, bending blade and continuous coil undergoing bending in the initial position after the insertion of the bending chisels astride a predetermined turn and showing diagrammatically the longitudinal movement of the bending chisels along their longitudinal axis and lateral movement of the bending chisels with respect to each

other in a direction parallel to the longitudinal axis of the unbent coil.

Fig. 8 is a view similar to Fig. 7 and showing rotation of the chisels about their longitudinal axis and the total arc swing of the bending chisels from the initial position of Fig. 7 to the final position shown therein.

Fig. 9 is a side elevational view of a projection lamp incorporating a filament formed into predetermined sections by the improved bending chisel head of the invention.

Referring to the drawings, and particularly to Fig. 9, the reference numeral **10** designates a projection lamp comprising a tubular envelope **12** provided with a base **14** and a mount **16**. This mount **16** has a vitreous stem **18** which is sealed to the envelope **12** and is provided with leading-in and supporting conductors **20** and **22** and a support spud **24** projecting from a press thereof. In the present embodiment the normally free ends of these conductors **20** and **22** are bent at right angles for mounting thereon an outer support **25** of a fixed upper bridge **26**. These supports **25** and a plurality of upper filament supports **28**, 3 in the present showing of Fig. 9, depend from an insulator **30**, suitably a piece of glass cane, of the upper bridge **26**. The lower hooked ends of the supports **28** are in engagement with the top interconnecting loops of a filament **32**. This filament **32** comprises eight coiled sections disposed in the usual manner in parallel vertical planes.

This filament **32** is provided with leg inserts **34** and **36** carrying coils thereon for threading onto legs of the filament **32**. These inserts **34** and **36** are suitably bent for welding to the lead-in and supporting conductors **20** and **22** near their upper right angle bends.

A bottom floating bridge **37** is slidable on conductors **20** and **22** by means of outer supports **38** which project from an insulator, suitably a piece of cane. Suitable filament supports **39** have their hooked upper ends inserted in the bottom loops of the filament **32**. A bottom slide guide **39'** projects from the insulator of the bridge **37** and is slidable on the spud **24**.

Coil bending machine

A coil bending machine **40** (Figs. 1 and 2) for projection lamp filaments **32** may have a frame as shown by parts **11** to **13** (Figs. 1 and 2), in U.S. Patent No. 2,693,204 consisting of a platform **44** (Fig. 2) and a base (not shown) integrated by suitable side plates and corner supports (also not shown). On this platform **44** may be mounted the improved coil bending head or bending chisel head **50** of the invention, an improved bending chisel operating (or swinging) mechanism **52** (Figs. 2 and 5), a bending blade **56** (Figs. 1, 2, 7 and 8), a bending blade advancing and retracting mechanism as shown in parts **50** to **70** (Fig. 1) in U.S. Patent No. 2,693,204 and a coil stop and locator mechanism as shown in parts **90** to **120** (Fig. 2) in U.S. Patent No. 2,693,204.

Bending chisel head 50

A pair of hinged elements **60** and **62**, Figs. 1, 2, 3, 5 and 6 particularly, of the bending chisel head **50**, swing about a center hinge post **64**. This post **64** in turn is mounted on a suitable bracket **66** (Fig. 2) upstanding from the platform **44** and suitably insulated therefrom. Each of the hinged elements **60** and **62** may be a casting having thick doughnut like registering washers (separated by the thickness of a washer) and integrated by a vertical member or plate. Each of these plates of the elements **60** and **62** has an upper portion or bending chisel mounting block **68** and **70** respectively (Figs. 1, 2, 3 and 6), which extends parallel to the axis of a continuous coil **71** (Figs. 7 and 8). These mounting blocks **68** and **70** respectively (according to the invention as hereinafter explained) carry bending chisels **72** and **74** respectively. The chisels **72** and **74** are mounted in normally angular spaced relation to each other, according to the pitch of a continuous coil **71** (Figs. 7 and 8) for insertion of a predetermined turn of a continuous coil **71** therebetween.

In the operation of the coil bending machine the operator holds the coil **71** on the center post **64** and positions one end thereof in the coil stop and locator which is movable in the position on the center post to locate a predetermined turn adjacent the bending chisels **72** and **74**.

The bending blade **56**, shown fragmentary in Figs. 1 and 2, may be mounted in a bending blade holder (not shown) as explained in greater detail in the hereinbefore mentioned U.S. Patent Number 2,693,204. This bending blade **56** is moved by the advancing and detracting mechanism against the continuous coil **71** (Fig. 7) to partially insert the predetermined turn between the chisels **72** and **74** and permit retraction of the coil stop and locator. A suitable line (not shown) connects the bending blade **56** to one side of a power supply (not shown) for resistive heating of the section of the coil **71** to be bent.

The bending blade **56** is then fully inserted into the blade receiving space in the coil **71** to secure the predetermined turn between the bending chisels **72** and **74**, whereupon the chisels are rotated by the operating mechanism laterally in opposite directions from a position similar to Fig. 7 to the position shown in Fig. 8 to form the desired bend in the coil. The bending chisels **72** and **74** are then retracted to their starting position (Fig. 7) leaving the bent coil on the bending blade **56** which retracts with the coil **71** carried thereby to its starting position indicated in Figs. 1 and 2. The operator then removes the bent coil from the bending blade **56** and positions the first bent section of the coil in the coil stop and locator which has been advanced preparatory for the next bending operation.

The coil bending head **50** of the invention has a bending chisel lateral positioning mechanism, a bending chisel rotating mechanism and a bending chisel reciprocating mechanism (Figs. 1 through 4 and 6) for each bending chisel **72** and **74**. A bending arc control mechanism for the bending chisel operating mechanism **52** on the platform **44** controls and limits the total arc swing of the bending chisels **72** and **74**. Each of the hinged elements **60** and **62** of the coil bending head **50** carries a radial extension or lug **88** (Figs. 2 and 5) which is pivotably connected to the arc control mechanism as hereinafter explained.

Bending chisel lateral positioning mechanism

As shown particularly in Figs. 1, 2 and 3 each of the mounting blocks **68** and **70** is provided with a lateral V-shaped slide guide **90** extending substantially parallel to the continuous unbent coil **71**. A slide **92** is held in each of the slide guides **90** by means of a mounting bolt **94** (Figs. 1, 3 and 6) extending through a transverse positioning slot **96** (Fig 6 particularly) in the blocks 68 and 70, and threadable into the V-like nose of the slide **92**. It will be understood that the head of each of the bolts **94** is rotatable in an enlarged portion of its positioning slot **96**. A single turn spring **98** (Fig. 6), such as a lock-washer, may be employed on each bolt **94** between the head of the bolt **94** and the inner portion of each of the blocks **68** and **70** so that when the bolt **94** is loosened to position the chisels **72** and **74** laterally, as hereinafter explained, the spring **98** still maintains the V-like nose of the slide **92** in the guide **90** of the blocks **68** and **70**.

Each of the mounting blocks **68** and **70** (Figs. 1 and 6) carries a positioning bolt support arm or cap **100** secured thereto, as by a bolt. A lateral positioning bolt **102** threadable in each of the arms **100** (one bolt **102** for one arm **100**) has a flange or slide engaging portion of reduced diameter. The flange engaging portion may be inserted laterally into a U-shaped slot in a flange or right angled lug **104** (Fig. 6) on the slide **92**, so that the bolt **102** and each of the blocks **68** and **70** move laterally together in a direction parallel to a continuous unbent coil

71 to laterally space the operating end of the bending chisels from the longitudinal axis of the coil bending head 50.

It will be understood that each of the bending chisel lateral positioning mechanism may be assembled by inserting the slide engaging portion of the lateral positioning bolt 102 into the slot in the flange 104. Each of the mounting bolts 94 is extended through the clearance slot 96 and threaded into the slide 92 until said slide 92 is securely engaged in the guide slide 90 of, for example, the mounting block 68. The arm 100 is threaded over the threaded end of the lateral positioning bolt 102 and then secured in place on the end portions of the mounting block 68, as by means of a bolt (Fig. 6).

It will be understood that the lateral positioning bolt 102 may be provided with, for example, 100 threads to the inch. For each complete turn of the bolt 102 the flange 104 and hence the inner slide 92 (when viewed in Fig. 1) is moved either inwardly or outwardly .01" depending on whether clockwise or counterclockwise rotation respectively of the bolt 102 is employed.

Each of the slides 92 has an angular mounting projection 106 (Figs. 1, 4 and 6) of suitable L-shaped vertical cross section (Fig. 4) for carrying thereon, as by bolts 108 (Fig. 6) a bending chisel spindle holder or body 110 (Figs. 1, 2, 3, 4 and 6).

Bending chisel spindle holders

Each of these bending chisel spindle holders or bodies 110 (Figs. 3 and 4) is a generally vertical plate having a spindle mounting hole 112. An axial slot 114 extends from the spindle hole 112 to the bottom face of the body 110 to suitably bifurcate the lower portion of the body 110. A spindle locking bolt 116 extends through the L-shaped mounting portion 106 of the slide 92 and the adjacent bifurcation in the body 110 and threads into the opposite bifurcation so that a bending chisel spindle 120 (Figs. 2, 3 and 4) may be secured therein.

This bending chisel spindle 120 is provided, as shown particularly in Figs. 1, 2, 3 and 4, with a keying flange 122 for use with the bending chisel reciprocating mechanism, as hereinafter explained. It will be understood that the left hand end of the spindle 120 may be suitably quadrented by radial slits. A vernier 124 (Figs. 1, 2, 3 and 4) of the bending chisel rotating mechanism may be secured about the left hand split end of the spindle 120 by means of its split collar lower portion 126 and a vernier mounting bolt 128 (Fig. 3), to secure therein, for example, the bending chisel 72. Both of the bending chisels 72 and 74 carry an electrical terminal 130 (on the left hand end when viewed in Figs. 1, 2 and 3) for connection to the other side of the hereinbefore mentioned power supply and resistively heating the one turn of the continuous coil 71 undergoing bending.

Bending chisel rotating (or angular positioning) mechanism

In addition to the vernier 124, each of the bending chisel rotating (or angular positioning) mechanisms has a pinion shaft 132 extending through the vernier 124 (Figs. 3 and 4). This pinion shaft 132 carries a knurled knob 134 (Figs. 1, 2 and 3) on the left hand end when viewed in Fig. 3 and a pinion gear 136 (Fig. 4) on the right hand end thereof. This gear 136 engages a gear segment 138 secured, as by bolts, to a stationary segmental calibrated scale 142 (Figs. 1–4). This scale 142 carries an L-shaped key 144 (Fig. 3) on its lower end, secured thereby as by brazing. This key 144 is slidable in a longitudinal slot 146 (Fig. 4) provided in the upper face of the bending chisel spindle holder or body 110. In addition, the keying flange 122 on the spindle 120 is engageable in a slot 148 (Fig. 3) in the key 144 so that the spindle 120, the key 144, the scale 142 and the vernier 124 and hence a bending chisel 72, for example, all move longitudinally with respect to the body 110, as hereinafter explained.

It will be understood that the vernier 124 and the spindle 120 and hence the bending chisels, either 72 and 74, will rotate together as a unit. By turning the knurled knob 134 in a clockwise direction, when viewed in Fig. 4, the vernier 124 and hence the bending chisel 72 (for example) is moved in a counterclockwise direction. Conversely by turning the knob 134 in a counterclockwise direction (when viewed in Fig. 4) the pinion gear 136 moves in a clockwise direction on the stationary gear segment 138. Hence, the vernier 124 and the bending chisel 72 moves in a counterclockwise direction. Thus, any desired position of the operating end of, either or both, the bending chisels 72 and 74 may be achieved accurately and easily without disturbing the lateral arrangement of the bending chisels 72 and 74 or the longitudinal position of the chisels 72 and 74 with respect to the body 110.

To assemble the rotary positioning or rotating mechanism, the assembled vernier 124 and calibrated scale 142 are mounted on the spindle 120 (so that the spindle flange 122 engages the slot 148 in the key 144 on the scale 142) by means of the split collar lower portion 126 and the mounting bolt 128. The key 144 on the scale 142 and the spindle 120 are inserted respectively into the slot 146 in the spindle body 110 and the spindle mounting hole 112 in the spindle body 110.

Bending chisel reciprocating mechanism

As shown in Figs. 1, 2, 3 and 4, the bending chisel spindle holder or body 110 carries a longitudinal or radial positioning bracket 150 on its upper surface, secured thereon, as by bolts 152 extending through flanged portions thereof. The upstanding lug-like portion of the bracket 150 is in threadable engagement with a bending chisel radially reciprocating or longitudinally positioning bolt 154 of the bending chisel reciprocating mechanism. This reciprocating bolt 154, like the lateral adjustment screw 102, has a key-engaging portion of reduced diameter on its left hand end, when viewed in Fig. 3, for insertion into the enlarged upper portion of, and for engagement with the lower reduced portion of, a key-hole like key 158 (Fig. 4) provided in the scale 142.

Thus, when the radially reciprocating or longitudinal positioning bolt 154 is turned in a clockwise direction, when viewed in Fig. 4, the scale 142 and the key 144 are moved backwardly from the body 110 or to the left when considered in Fig. 3. This movement of the key 144 of course moves the spindle 112 and hence the bending chisel 72, for example, in the same direction therewith.

It will be understood that the reciprocating bolt 154, like the lateral positioning bolt 102, may be provided with 100 threads to the inch. Thus each complete turn of the bolt 154 moves the bending chisel 72, for example .01" along its longitudinal or radial axis.

Each of the longitudinal positioning or reciprocating mechanisms 84 may be assembled easily by threading the bolt 154 through the bracket 155, inserting the key engaging end thereof into the key 158, and bolting the bracket 150 to the spindle body 110.

Bending chisel operating mechanism

The bending chisel operating or swinging mechanism 52, except as hereinafter described is essentially the same as the bending chisel operating mechanism disclosed in the before-mentioned U.S. Patent No. 2,693,204. This bending chisel operating mechanism 52 as shown particularly in Figs. 1, 2 and 5 has a slide guide 170 (essentially a pair of tapered guide rails), mounted by means of a bracket 172 (only one of which is shown in Fig. 2) on the platform 44 of the coil bending machine 10.

Bending arc control mechanism

The bending arc control mechanism has a lower slide plate 174 (Figs. 2 and 5) for engagement with the slide

guide 170 and an upper insulating block 175 for carrying thereon an overhanging collar bracket or plate 176. Slide retaining plates 178 (Figs. 1, 2 and 5) maintain the lower slide 174 in contact with slide guide 170. As shown in Figs. 1 and 2, the collar bracket 176, insulating block 175 and lower slide 174 are integrated by a pair of bolts 180 which are insulated from the collar bracket 176 by suitable bushings.

This collar bracket 176 extends beyond the insulating block 175 (overhanging the rails 170) and carries on each of the opposite projecting ends thereof a generally hollow plunger body 182 (Figs. 1, 2 and 5) which is pivotably secured thereon, as by means of a shoulder bolt 184. Each of the plunger bodies 182 is provided with longitudinal registering plunger pin slots 186 (Figs. 2 and 5) for use as hereinafter explained. Each of the plunger bodies 182 carries a round plunger 188 provided with a plunger pin 190, handily for engagement with the plunger pin slots 186. From a consideration of Figs. 2 and 5, it will be understood that each of the plungers 188 extends beyond its respective body 182 and has its normally free end pivotably secured, as by means of a shoulder bolt 192, to one of the projections 88 on the hinged elements 60 and 62. A compression spring 194 on the plunger 188 extends from the end of the plunger barrel 182 to a shoulder on the plunger 188 adjacent to the bolt 192.

As shown in Figs. 1, 2 and 5 an upstanding hinged element stop bracket 200 may be mounted (on either side of the coil bending head 50 and generally in parallel alignment with the plunger bodies 182) by means of its lower flanged portion to the platform 44, as by welding. Each of these hinged element stop brackets 200 may be provided with an adjustable hinged element stop 202 (Figs. 1, 2 and 5), suitably a threaded bolt having, for example 100 threads to the inch and provided with a lock nut 204.

It will be understood that the slide 174 is reciprocated back and forth on the slide guide 170 by means (not shown) such as the bending chisel operating cam mechanism described in the hereinbefore mentioned U.S. Patent No. 2,693,204.

As shown in Fig. 5, the maximum reciprocating travel of the slide bracket 176 may be set and held constant, for example, the distance A—A (Fig. 5). Hence, the maximum rotation of the hinged element 62 for example is through a clockwise arc B—B (Fig. 5). However, the upper hinged element stop 202 may be independently moved to the left when viewed in Fig. 5, to reduce the rotation of, for example, the hinged element 62 to an angle less than the maximum angle B—B shown in Fig. 5.

Thus, when the projection 88 on the hinged elements 62 strikes the hinged element stop 202, the hinged element 62 ceases to rotate. The plunger body 182 continues to move to the right when viewed in Figs. 2 and 5, compressing the spring 194 and causing the plunger pin 190 to move toward the left hand end (when viewed in Fig. 5) of the plunger pin slot 186.

Thus, it will be seen from the foregoing description that the present invention has provided an improved bending chisel head 50 for the projection lamp coil bending machine 10. The improved bending chisel head 50 for a projection lamp filament 32 has a bending chisel rotating mechanism (bending chisel rotary positioning mechanism) for rotating the bending chisels 72 and 74 about their longitudinal axes, a bending chisel reciprocating mechanism (bending chisel longitudinal or radial positioning mechanism) for moving the chisels 72 and 74 along their longtiudinal axes and a bending chisel lateral positioning mechanism for positioning the bending chisels 72 and 74 with respect to each other and the longitudinal axis of the continuous unbent coil 71. The invention also provides a bending arc control mechanism for the bending chisel operating mechanism 52 which limits and controls the final position of the bending chisels 72 and 74.

The improved bending chisel head 50 is capable of positioning each bending chisel, for example 72, longitudinally or radially with respect to its own longitudinal axis, rotatably about its own longitudinal axis and laterally with respect to other bending chisel 74 and parallel to the longitudinal axis of the unbent coil 71 but independently of the other bending chisel 74. Similarly, the total arc swing of the bending chisels 72 and 74 is accurately and independently controlled by the bending arc control mechanism.

Although a preferred embodiment of the invention has been disclosed it will be understood that modifications may be made within the spirit and scope of the invention.

I claim:

1. In a machine for bending a continuous coil into a multi-section lamp filament, an improved bending chisel assembly having support means pivotably mounted to oscillate about an axis, mounting means slidable in said support means, a bending chisel secured on said mounting means, means on said support means connected to said mounting means and operable to laterally position an operating end of said bending chisel with respect to the axis of said support means, means operatively connected to said bending chisel and operable to cause movement of said bending chisel along its longitudinal axis to radially position the operating end of said bending chisel with respect to the axis of said support means, means operatively associated with said bending chisel and operable to cause rotary movement of said bending chisel about its longitudinal axis to position the operating end of said bending chisel at a desired angle with respect to the axis of said support means, and means connected to said support means for causing oscillating movement of the latter.

2. In a machine for bending a continuous coil into a multi-section lamp filament, an improved bending chisel assembly having support means pivotably mounted to oscillate about an axis, mounting means slidable in said support means, a bending chisel secured on said mounting means, means on said support means connected to said mounting means and operable to laterally position an operating end of said bending chisel with respect to the axis of said support means, means operatively connected to said bending chisel and operable to cause movement of said bending chisel along its longitudinal axis to radially position the operating end of said bending chisel with respect to the axis of said support means, means operatively associated with said bending chisel and operable to cause rotary movement of said bending chisel about its longitudinal axis to position the operating end of said bending chisel at a desired angle with respect to the axis of said support means, means connected to said support means for causing oscillating movement of the latter, and stop means disposed adjacent the path of movement of said support means and operable to limit and control its path of movement.

3. In a machine for bending a continuous coil into a multi-section lamp filament, an improved bending chisel assembly having support means pivotably mounted to oscillate about an axis, mounting means slidable in said support means, a bending chisel secured on said mounting means, a member in threaded engagement with said support means and connected to said mounting means, said member being operable to laterally position an operating end of said bending chisel with respect to the axis of said support means, means operatively connected to said bending chisel and operable to cause movement of said bending chisel along its longitudinal axis to radially position the operating end of said bending chisel with respect to said support means, means operatively associated with said bending chisel and operable to cause rotary movement of said bending chisel about its longitudinal axis to position the operating end of said bending chisel at a desired angle with respect to the axis of said support means, and means connected to said support means for causing oscillating movement of the latter.

4. In a machine for bending a continuous coil into a

multi-section lamp filament, an improved bending chisel assembly having support means pivotably mounted to oscillate an axis, mounting means slidable in said support means, a bending chisel secured on said mounting means, means on said support means connected to said mounting means and operable to laterally position an operating end of said bending chisel with respect to the axis of said support means, a slide connected to said bending chisel and movable in said mounting means, a member in threaded engagement with said mounting means and connected to said slide, said member being operable to cause movement of said slide and said bending chisel along their longitudinal axis to radially position the operating end of said bending chisel with respect to said axis, means operatively connected to said bending chisel and operable to cause movement of said bending chisel along its longitudinal axis to radially position the operating end of said bending chisel with respect to the axis of said support means, means operatively associated with said bending chisel and operable to cause rotary movement of said bending chisel about its longitudinal axis to position the operating end of said bending chisel at a desired angle with respect to the axis of said support means, and means connected to said support means for causing oscillating movement of the latter.

5. In a machine for bending a continuous coil into a multi-section lamp filament, an improved bending chisel assembly having support means pivotably mounted to oscillate about an axis, mounting means slidable in said support means, a bending chisel secured on said mounting means, means on said support means connected to said mounting means and operable to laterally position an operating end of said bending chisel with respect to the axis of said support means, a slide connected to said bending chisel and movable in said mounting means, a gear segment on said slide, a member in threaded engagement with said mounting means and connected to said slide, said member being operable to cause movement of said slide and said bending chisel along their longitudinal axis to radially position the operating end of said bending chisel with respect to said axis, shaft supporting means connected to said bending chisel, a shaft extending through said shaft supporting means, a gear on said shaft engageable with said gear segment to cause rotary movement of said shaft supporting means and said bending chisel about the longitudinal axis of the latter to position the operating end of said bending chisel at a desired angle with respect to said axis, and means connected to said support means for causing oscillating movement of the latter.

6. In a machine for bending a continuous coil into a multi-section lamp filament, an improved bending chisel assembly having support means pivotably mounted to oscillate about an axis, mounting means slidable in said support means, a bending chisel secured on said mounting means, means on said support means connected to said mounting means and operable to laterally position an operating end of said bending chisel with respect to the axis of said support means, means operatively connected to said bending chisel and operable to cause movement of said bending chisel along its longitudinal axis to radially position the operating end of said bending chisel with respect to said support means, means operatively associated with said bending chisel and operable to cause rotary movement of said bending chisel about its longitudinal axis to position the operating end of said bending chisel at a desired angle with respect to the axis of said support means, a slide disposed adjacent said support means, means of the lost-motion type pivoted on said slide and to said support means, stop means disposed in the path of movement of said support means to limit and control its path of movement, and means connected to said slide and operable to reciprocate the latter to thereby cause swinging movement of said support means about its axis.

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