

July 13, 1954

J. FLAWS, JR., ET AL

2,683,473

METHOD AND APPARATUS FOR MAKING FILAMENT MOUNTS

Filed March 31, 1950

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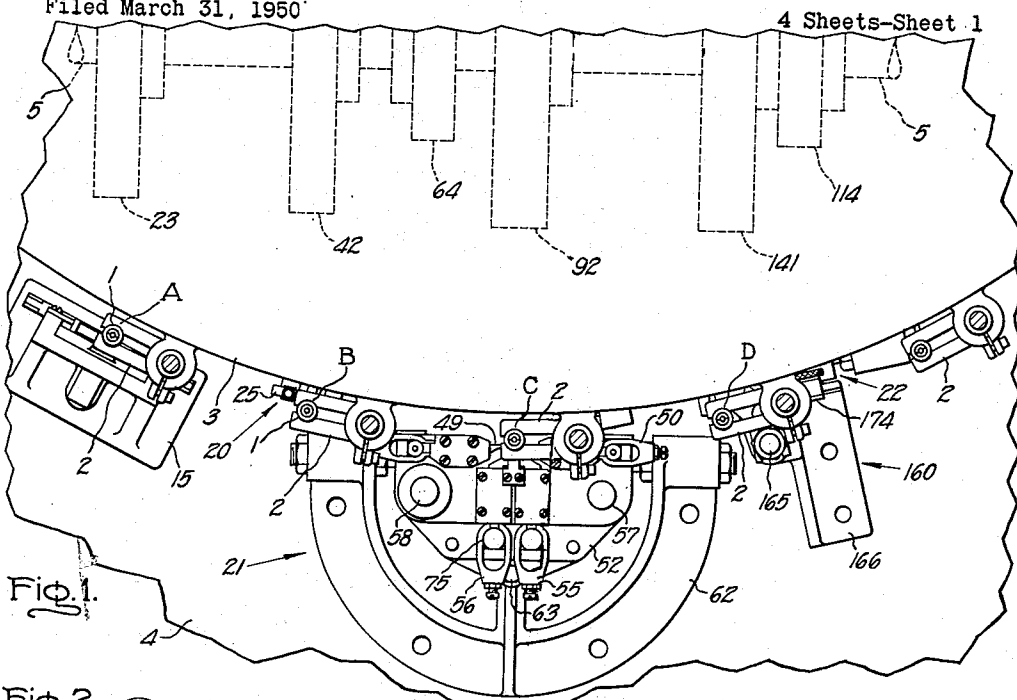
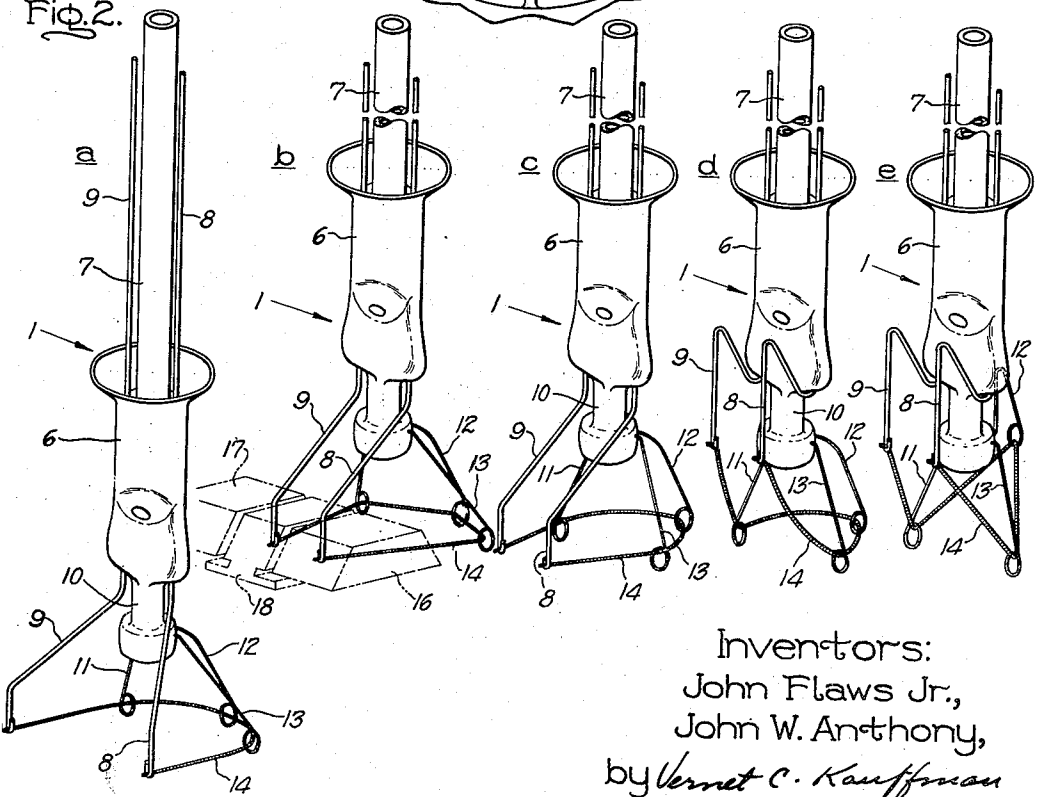


Fig. 1.

Fig. 2.



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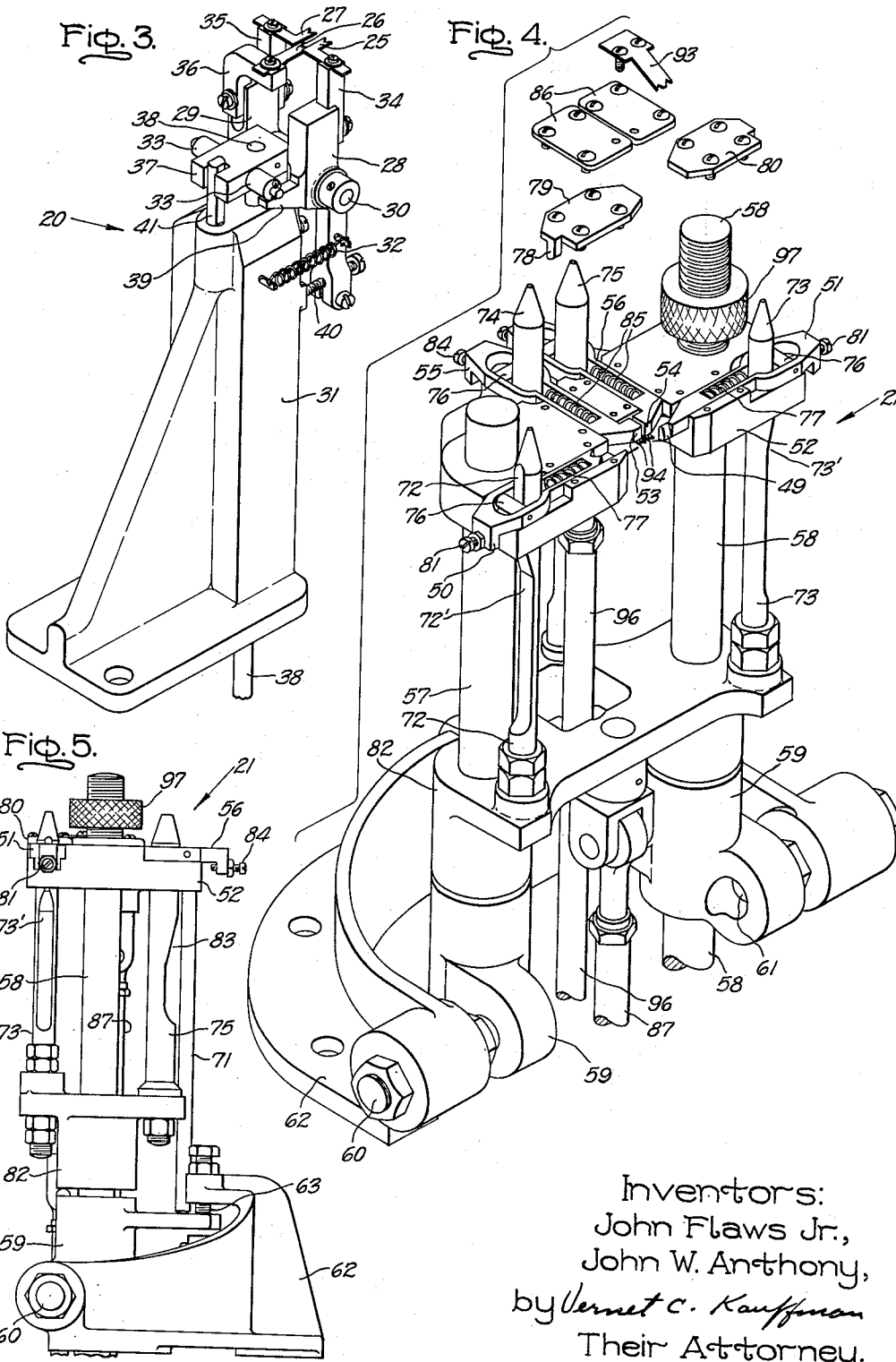
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4 Sheets-Sheet 2



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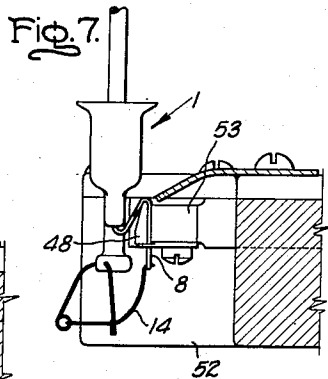
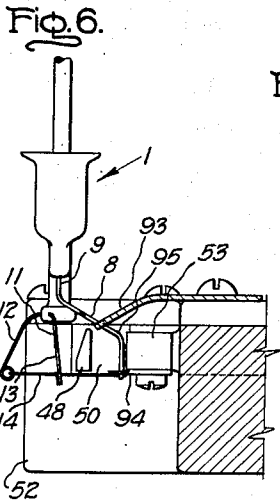
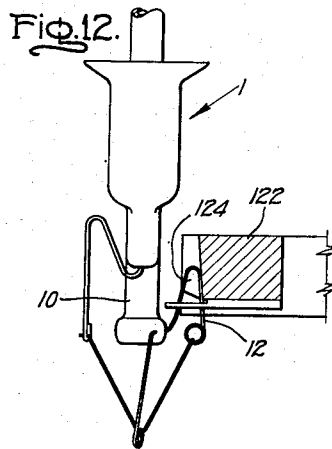
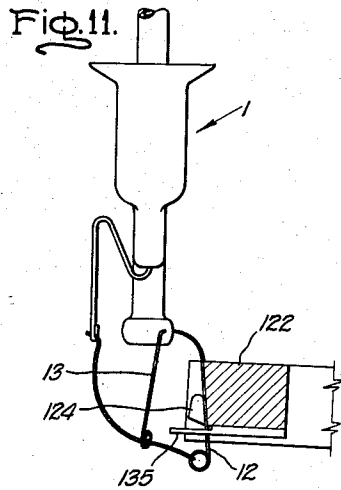
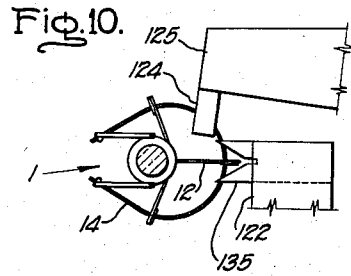
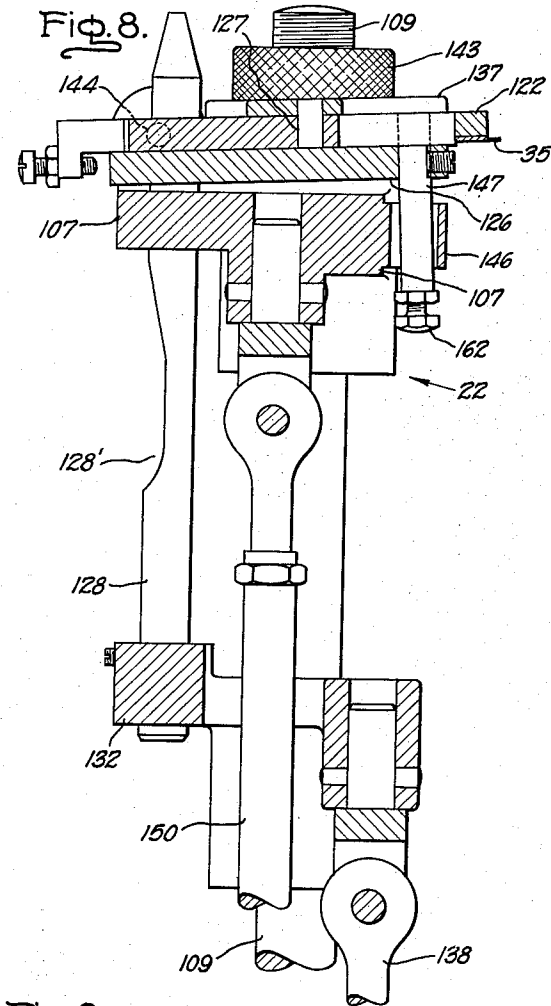
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Fig. 9.

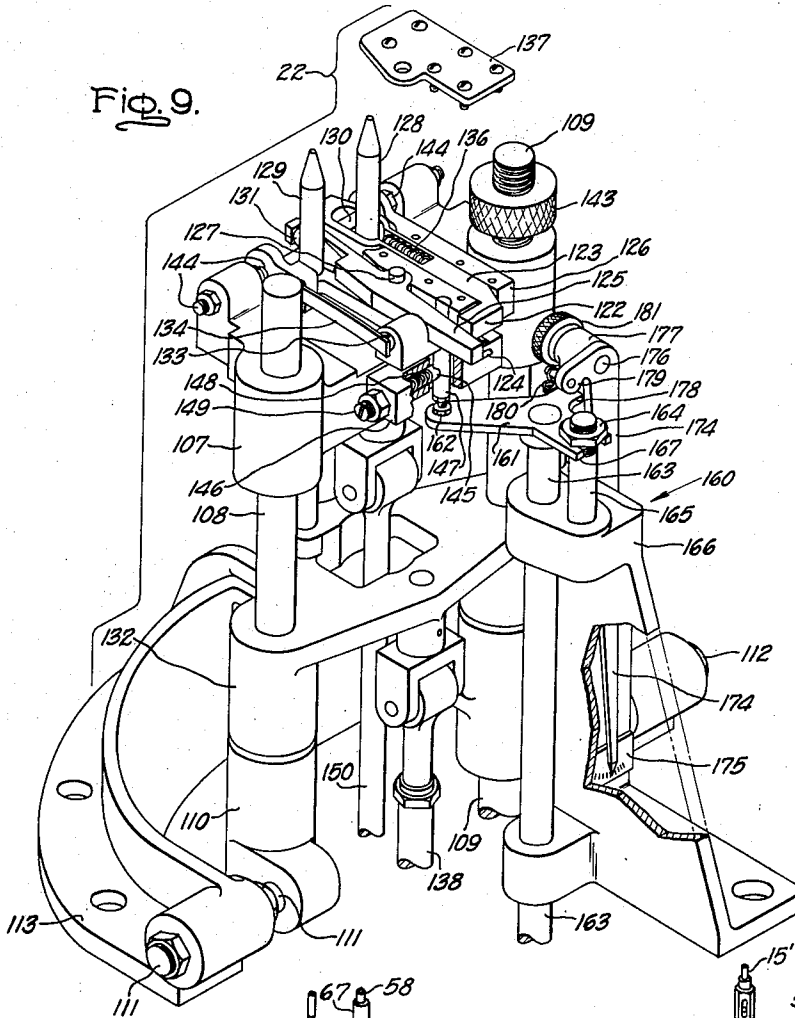
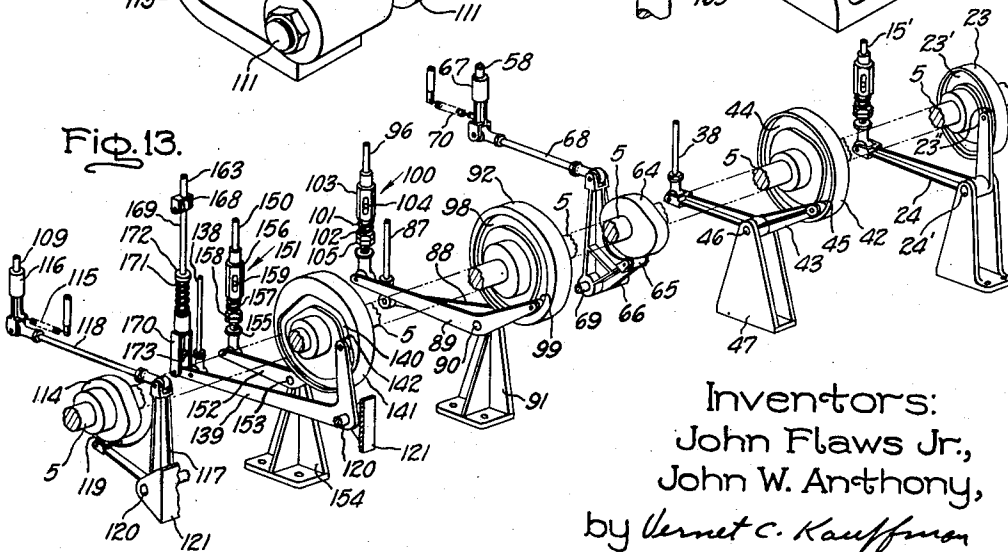


Fig. 13.



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# UNITED STATES PATENT OFFICE

2,683,473

## METHOD AND APPARATUS FOR MAKING FILAMENT MOUNTS

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Application March 31, 1950, Serial No. 153,076

8 Claims. (Cl. 140—71.6)

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Our invention relates to apparatus for making filament mounts for incandescent lamps and the like. More particularly, our invention relates to apparatus especially suited to the automatic manufacture of small and very compact filament

mounts. Heretofore, the manufacture of certain very complex and compact filament mounts for small multiple or higher voltage incandescent lamps used for night-lights, Christmas tree decorations, etc. has been restricted to manual filament mounting operations. This manner of operation was necessitated because of the difficulty of draping a relatively long coiled filament over support wires at offset relations to each other and of attaching said filament to leading-in wires offset from adjacent support wires. The size of the mount also contributes to the difficulty of manufacture in that the smaller mounts do not have sufficient clear space in the region of the support and leading-in wires to accommodate automatic apparatus.

One object of our invention is to provide apparatus for manufacturing filament mounts for lamps which apparatus are particularly adapted to make a mount having a relatively long filament attached to support and leading-in wires at alternately offset positions. By attaining this object, the economies and uniformity of machine manufacture are recovered and much greater speeds of production are available.

Another object of our invention is to provide an automatic means for forming concentrated filament mounts for lamps by first manufacturing a relatively large and widely spread mount, and then reforming said mount to the desired shape. The means of our invention permits the use of existing well developed apparatus in the initial steps of forming the mount and provides for the reshaping of said mount by operations capable of being performed by mechanical means. The first steps in the manufacture provide for the construction of a mount comprising a supporting body, in the form of a vitreous stem, and of leading-in and support wires retained by said stem and extending outwardly therefrom with their free ends engaging spaced portions of a filament located beyond the end of the stem. Succeeding reforming steps of the manufacture bend the leading-in wires and the support wires of the mount so that the free ends thereof supporting the various portions of the filament are relocated at different positions relative to the stem. The reforming steps provide for the manufacture of one form of mount, for example, by

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bending the outwardly extending ends of the leading-in wires and certain support wires to positions nearer the stem and by so doing position the filament nearer to and around at least a part of said stem. The arrangement of the leading-in and support wires is such that the free ends of alternate wires around the stem are offset longitudinally from each other relative to the stem and the filament accordingly has a zig-zag final form.

Still another object of our invention is to provide means for bending a fold or so-called loop-back section in the leading-in and support wires of a mount so as to reduce the effective length of said wires and position the connected portions of the filament nearer the stem. The above operations are performed without injury to the filament and are particularly adapted to develop the compact mount forms necessary for insertion into small size bulbs and bulbs having small necks. The fold or loop-back bend is made in the leading-in and support wires by forming a bend in the portions thereof adjacent the stem and in intermediate portions thereof, the operations being performed in such a manner that the extending ends of the leading-in and support wires are properly relocated.

Another object of our invention is to provide apparatus for completing a mount for a lamp in the manner hereinbefore referred to, which apparatus is comprised of a plurality of devices located at separate work stations to which the mount is advanced in turn. A carrier or turret having an indexing motion is used to advance the mount to the work stations, and cams on a main drive shaft are used to actuate each of the devices in synchronism with the advance of the mount. The present invention constitutes a further improvement in machines for automatically making mounts for high voltage electric lamps of small size and special service. Such apparatus provides for the complete automatic manufacture of the mount ready for use and insertion in such lamps.

Still other objects and advantages of our invention will appear in the following detailed disclosure which refers in particular to the species of apparatus appearing in the drawing.

In the drawing, Fig. 1 is a plan view of a portion of a lamp making machine including the apparatus of our invention, which portion comprises a carrier for advancing a lamp mount to a series of work stations A, B, C, and D and apparatus permanently located at said work stations; Fig. 2 is a group of five perspective views a,

*b*, *c*, *d*, and *e* on an enlarged scale (several times larger than actual size) of a lamp mount during various steps in the reformation thereof by our apparatus; Fig. 3 is a perspective view of the support wire repositioning device occupying the second work station B; Fig. 4 is a partially exploded perspective view of the leading-in wire reforming device located at the third work station C; Fig. 5 is an elevation of the opposite side of the leading-in wire reforming device shown in Fig. 4; Figs. 6 and 7 are fragmentary sections on a large scale through a portion of the leading-in wire reforming device in the course of two successive steps in the bending of a leading-in wire of a mount; Fig. 8 is a vertical section through the center of the upper portion of the support wire reforming device occupying work station D, which section is taken in a direction transverse to the direction of movement of the mount; Fig. 9 is a partially exploded view of the support wire reforming device; Fig. 10 is a fragmentary plan view on a large scale of the bending and clamping jaws of the support wire reforming device at the start of their advance toward the mount; Figs. 11 and 12 are fragmentary sections on a large scale of the means shown in Fig. 10 in succeeding steps in the operation thereof; and Fig. 13 is a diagrammatic perspective view of the drive shaft and associated actuating means for the devices of the invention.

The manufacture of a mount in accordance with the invention provides, first, for the incorporation of the various elements thereof into a uniform and readily obtainable mount assembly, and then the reformation or reshaping of the assembly into a mount of the complex character and much reduced spread desired. The first steps in the method are preferably performed in one of the various forms of lamp making apparatus presently in use; whereas, the reforming steps in the method preferably occur in apparatus such as that disclosed in the drawing and, as will be described in connection therewith, are comprised of separate steps occurring at a succession of work stations A, B, C, and D in said apparatus. The lamp mount 1 manufactured during the first part of the method is advanced to each of the work stations A, B, C, and D, in turn, by a head 2 attached to the periphery of a carrier or turret 3 (only partially shown herein) and is successively operated upon by the various devices, comprising the reforming apparatus, which are permanently mounted upon a table 4 located below the course of travel thereof. Periodic indexing movements occurring in the turret 3 under the influence of means (not shown) actuated by the rotation of a drive shaft 5 under the adjacent center portion of the turret 3 and said table 4 cause the heads 2 to be advanced at regular intervals and other means associated with the devices at each station and the drive shaft 5 to provide for the actuation of each of the devices. The manner of dividing the mount-making operations into steps performed at separate work stations, and the use of apparatus comprising a carrier for advancing the mount and separate work devices, all of which are actuated by a common source, corresponds to usual lamp making practice and is particularly desirable in that it allows the apparatus of the present invention to be readily incorporated with other lamp making procedures and apparatus. The disclosed apparatus can, for instance, be used with the mount-making apparatus of United States Patent 1,907,532—Flaws, dated May 9,

1933, which apparatus has the same arrangement of means. The apparatus of the present invention is arranged so that the work stations A, B, C, and D follow those occupied by the prior patented mount-making apparatus and in the form shown in the drawing is constructed and arranged in a manner best suited to reform the type lamp mount made by said apparatus.

The lamp mount 1 at the time of its arrangement at work station A of the disclosed apparatus appears as shown at *a* in Fig. 2 and comprises a main supporting body, the tipless type stem tube 6; the exhaust tube 7; the current conductors, the leading-in wires 8 and 9; the stem arbor 10, the support wires 11, 12, and 13; and the U-shaped coiled filament 14. The lamp mount 1 is held in the apparatus with the filament 14 lowermost. The filament has opposite ends clamped in hooks in the free ends of the leading-in wires 8 and 9 and is supported at spaced intermediate points by the free ends of support wires 11, 12, and 13. The mount 1 is of relatively open construction with said filament 14 located in a transverse plane beyond the end of the stem tube 6 and arbor 10. This particular filament mount 1 is that made by the apparatus disclosed in Patent No. 1,907,532—Flaws, and illustrates the general type of filament mount suitable to reformation by our apparatus. However, our invention is not restricted to a filament mount 1 of this exact construction, size, shape, or proportions. The filament 14 of the mount 1 extends laterally thereof an amount permitting its use in many lamps but is so large as to prevent its insertion into and operation in the smaller size bulbs of many low wattage night-light and decorative types of lamps.

Reformation or reshaping of the mount 1 is initiated by repositioning the leading-in wires 8 and 9 in the manner shown at *b* in Fig. 2, an operation which is effected by the leading-in wire repositioning device 15 at work station A. The ends of the leading-in wires 8 and 9 are bent around to positions closer to each other by the closing movement of two anvils 16 and 17 (indicated in Fig. 2) toward the stationary anvil 18 and take positions causing the filament 14 to be pulled taut around the support wires 11, 12, and 13. The following step in the reshaping of the mount 1 takes place at work station B, the next taken in the order of movement of the mount 1, and consists in bending the extending looped-ends of the outer support wires 11 and 13 around to positions at opposite sides of the mount 1 and in a plane through the axis thereof. This bending operation also positions the looped-ends of the support wires 11 and 13 closer to the arbor 10. The bending operation, which is performed by the support wire repositioning device 20 (Figs. 1 and 3), moves the support wires 11 and 13 from positions at 55° of either side of support wire 12 to positions 90° therefrom and by so doing reduces the spread of the mount and the filament 14 which again becomes loosely held as shown at *c*, Fig. 2. The succeeding operations of the method occur at work station C and consist of operations performed by the leading-in wire reforming device 21 which bends the ends of the leading-in wires 8 and 9 clamped to the filament 14 upward and inward (*d*, Fig. 2) to the elevation of a horizontal plane through the end button on the arbor 10 and to positions closer to the longitudinal center or axis of the mount 1. These operations which are performed by means moving up-

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ward against intermediate portions of the wires 8 and 9 make a so-called loop-back bend in each leading-in wire 8, 9 and considerably reduce the spread of the filament mount 1 in the plane perpendicular to that of the support wires 11 and 13. The filament 14 is still loosely held in the mount 1 as the ends of the leading-in wires 8 and 9 are still at substantially the same distance from the loops in the support wires 11 and 13. The final shaping of the mount takes place at work station D where the support wire reforming device 22 causes an intermediate portion of the support wire 12 to be pushed upward so that the looped end thereof is bent upward and inward toward the end of the arbor 10. The mount 1 is further reduced in spread by this operation and the filament 14 is placed under moderate tension. The mount 1 then appears as shown at e, Fig. 2, and is in a compact form well suited to efficient operation in lamps for many practical purposes. A one-third reduction occurs in the spread of the mount in the course of the above-described operations and said mount 1 is now of equal width and breadth. The illustrated mount 1 has only  $\frac{3}{8}$  inch spread and, accordingly, would be difficult to manufacture on a commercial scale by other means.

In order to present the full details of the above-outlined method and apparatus, reference is made to the Patent No. 1,907,532, dated May 9, 1933, which is also assigned to the assignee of the present invention, for the constructional details of means, herein represented by the head 2, for holding and advancing the mount 1 to each of the work stations. The heads 2, illustrated, are mounted at regularly spaced locations about the periphery of a turret 3 and are advanced successively to work stations, among which are work stations A, B, C, and D, about said turret 3 by rotative indexing movements therein by an actuating means presently represented by the drive shaft 5. The manner of holding the heads 2 and of advancing them under influence of a single constantly rotating driving means corresponds to that of the above-mentioned patent and other lamp-making apparatus. Each head 2 is particularly adapted to support a single mount 1 similar to that shown at a, Fig. 2, and holds said mount 1 in a vertical position with the end portion including the filament 14 lowermost and at a definite height above the surface of a table 4 located below the turret 3. At the time of the advance of the head 2 to work station A, the first occupied by the apparatus shown, the coiled filament 14 is held in a bowed or U form through the engagement of the leading-in wires 8 and 9 with the ends thereof and the engagement of the support wires 11, 12, and 13 with intermediate portions thereof. The curved midportion of the filament 14 is retained by large loops in the support wires 11, 12, and 13 which radiate from the side of the arbor 10 opposite the periphery of the turret 3 at a spacing of 55°. The leading-in wires 8 and 9 are at the opposite side of the mount 1 and are spaced an amount best suited to the operation of the filament mounting apparatus.

The arrangement of the mount 1 at work station A positions it directly above the leading-in wire repositioning device 15 which has a cycle of operation causing the anvils 16, 17, and 18 to close on the leading-in wires as indicated in Fig. 2. A device of this type is shown in detail in the above-mentioned Flaws Patent 1,907,532 wherein it is used for clamping the leading-in wire hooks securely about the ends of the fila-

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ment. In the present application of said device, the anvil 18 is first caused to take a position between the leading-in wires 8 and 9 and then the anvils 16 and 17 take a sweeping motion toward anvil 18 from opposite sides to carry the leads 8 and 9 against said anvil 18. The operation forces the leads 8 and 9 to positions closer together and in so doing causes sufficient cold working thereof to cause them to remain in substantially that position after the anvils 16, 17, and 18 withdraw at the end of the operative period. The leading-in wire repositioning device 15 is like all of the other devices of the apparatus operated by actuating means located below the table 4 and as shown in Fig. 13 is under control of the rotation of the cam 23 on the drive shaft 5. The lever 24 is rocked about a pivot 24' in accordance with radial changes in position of portions of a cam track 23' in the face of cam 23, which track 23' is engaged by a roller 23'' on one of the arms of said lever 24, and transfers motion to the repositioning device 15 through the rod 15' in engagement with another arm of said lever 24.

Following the expiration of the interval during which the head 2 is located at station A, the index of the turret 3 advances the head 2 and mount 1 to work station B where the outer support wires 11 and 13 are bent around toward the leads 8 and 9 by the support wire repositioning device 20 (Figs. 1 and 3). The mount 1 advances to a position opposite the notched fingers 25, 26, and 27 of the repositioning device 20 which occupies a position to one side of the work station and which is largely covered by the turret 3. The notched fingers 25, 26, and 27 at that time are tilted back from the position shown in Fig. 3 in that their supporting levers 28 and 29, which are located upon opposite ends of a pivot pin 30 carried by the standard 31, are tipped backward against the normal contraction force of the springs 32 (only one being shown) by the pressure of the rollers 33. The operation of the device 20 begins with a forward movement of the fingers 25, 26, and 27 influenced by motion of levers 28 and 29. The outer fingers 25 and 27 are attached to extensions 34 and 35 of respective levers 28 and 29 which are correspondingly shaped; whereas, the finger 26 is attached to an offset extension 36 on the back of lever 29. Motion is initiated by the upward travel of a block 37 on the upper end of the vertical operating rod 38 of the device which motion displaces the rollers 33 on opposite sides of said block 37 correspondingly and thereby relieves the pressure of said rollers 33 against ears 39 (only one being shown) on levers 28 and 29 and allows the contraction force of corresponding springs 32 (only one shown) to tilt the levers 28 and 29. The fingers 25 and 27 have positions somewhat in advance of finger 26 and swing into engagement with the midportion of the support wires 11 and 13 which bend at positions directly adjacent the arbor 10. The bending operation effects both a sideward rearrangement of the support wires 11 and 13 in the direction of movement of the fingers 25 and 27 and an inward rearrangement thereof which positions their ends closer together in that the notched ends of the fingers 25 and 27 are spaced closer together than the portions of the support wires 11 and 13 engaged thereby and said portions slide to the center of said notches during the bending operation. The intermediate finger 26 does not engage the support wire 12 until the bending operation is almost complete

and has the function of holding and, if the support wire 12 is pulled out of position in the bending of support wires 11 and 13, of centering the support wire 12. The full movement of the bending fingers 25, 26, and 27 is complete when corresponding stop screws (like that shown at 40) on the lower ends of the levers 28 and 29 butt against the support standard 31.

The operation interval of the support wire reposition device 20 starts with the upward movement of the operating rod 38 and is terminated by the return downward movement thereof which again brings the rollers 33 against the ears 39 on the levers 28 and 29 and swings the bending fingers 25, 26, and 27 out away from the support wires 11, 12, and 13. In this interval the operating rod 38 is slid vertically in a bearing in the standard 31 and is capable of taking only vertical movement in that the block 37 on its upper end slides along a guide post 41 extending from the upper surface of the standard 31. The extent and timing of the movement of the operating rod 38 is controlled by cam actuated means located below the table 4 and, as shown in Fig. 13, comprised of a driven shaft 5, a cam 42 and a lever 43, the latter under influence of said cam 42 and influencing the lower end of the operating rod 38. The driven shaft 5 is a part of the main operating means for the turret 3 and other apparatus (not shown) located at the work stations thereabout and has a rate of rotation completing one revolution during each index and rest period of said turret 3 and accordingly each index of the mount-carrying heads 2 in the manner of apparatus disclosed in detail in Flaws' Patent 1,907,532 hereinbefore referred to. An irregular track 44 in the face of the cam 42 is engaged by a roller 45 on one end of the lever 43 and causes motion of said lever 43 about a pivot pin 46 on the stationary bracket 47 extending from the frame (not shown) of the machine on the basis of its position with respect to the center of the driven shaft 5.

The operations taking place at work station C, the next work station to which the mount 1 is advanced, are those of the leading-in wire reforming device 21 and reduce the lateral spread or maximum over-all or transverse dimension of the filament mount 1 in the plane of the leading-in wires 8 and 9 by relocating the extending ends thereof in engagement with the filament 14 closer to the stem tube 3 and the arbor 10 as shown at *d* in Fig. 2. The mount 1 is advanced to work station C at a moment when the upper portion of the reforming device 21 (Figs. 1, 4, and 5) is rocked back out of the path of travel from the mount 1 and is initiated to the first operations of said device 21 when said device 21 is tilted back to the vertical position shown and operative relation thereto. The tilting operation carries corresponding wire bending or anvil jaws 48 and 49 (Figs. 4, 5, 6, and 7) formed by the ends of the slides 50 and 51, respectively, at opposite sides of the upper platform 52 of the reforming device 21 into a vertical plane passing between the ends of the leading-in wires 8 and 9 and the support wires 11 and 13, as indicated by jaw 48 in Fig. 6, and also positions the wire-clamping jaws 53 and 54 which are integral parts of slides 55 and 56, respectively, on the center portion of said upper platform 52 opposite intermediate portions of the leading-in wires 8 and 9, as indicated by jaw 53, Fig. 6. The upper platform 52, which is located upon two upstanding columns 57 and 58 held by the opposite ends of a yoke

59, is moved toward the mount 1 by the tilt effected in said columns 57 and 58 when said yoke 59 is turned about the studs 60 and 61 on the opposite arms of the stationary bracket 62 and is moved under the influence of means engaging the lower end of the column 58 which passes through an opening in the table 4, the support for bracket 62. The extent of the tilting movement and, accordingly, the specific position taken by the device 21 is determined by the engagement of the center portion of the yoke 59 (Fig. 5) with the stop screw 63 on the bracket 62.

The arrangement of the device 21 at operative relation to the mount 1, as effected by the tilting movement thereof, as well as all other operative functions of said device 21 are under control of means actuated by the driven shaft 5 and cams located thereon. In the presently considered instance having to do with the tilting movement of the device 21, motion results from changes in shape of the cam 64 passing into engagement with a roller 65 on one end of the lever 66 and is transferred from said lever 66 to the coupling 67 on the lower end of the column 58 by the tie rod 68. The lever 66 is mounted upon a pivot pin 69 extending from a stationary part of the machine (not shown) and effects an influence opposite that of the contraction force of the helical spring 70 which is stronger than required to counteract the weight of the yoke 59, upper platform 52 and other elements of the device pivoted on the studs 60 and 61.

At the time of the arrangement of the reforming device 21 at operative relation to the mount 1, the jaws 48, 49, 53 and 54 are at the vertical elevation of an intermediate portion of the leading-in wires 8 and 9 as the support platform 52, which is slidable upon the columns 57 and 58, is then supported by a leg 71 (Fig. 5) extending from the back portion thereof to the top surface of the yoke 59. The jaws 48, 49, 53 and 54 are also spaced horizontally from the leading-in wires 8 and 9, at that time, as the slides 50, 51, 55, and 56, respectively, of which they are a part are at retracted positions in the support platform 52 because of the presence of thick upper end portions of respective cam rods 72, 73, 74, and 75 behind a roller 76 bridging an opening in the back part of each slide.

The next operation of the device 21 advances the wire bending jaws 48 and 49 end foremost to positions behind the leading-in wires 8 and 9 and results from movements of the slides 50 and 51 when an upward movement of the cam rods 72 and 73 advances cutaway portions 72' and 73', respectively, thereof of less thickness behind the rollers 76. The contraction force of springs 77 located within pockets in the slides 50 and 51 behind depending tongues 78 on cover plates 79 and 80, at that time pushes said slides 50 and 51 forward to the extent allowed by the change in the shape of the portions of the cam rods 72 and 73 presented to the rollers 76. The jaws 48 and 49 are finally correctly positioned when the stop screws 81 on the ends of the slide 50 and 51 butt against the edge of the upper platform 52 so as to terminate the movement. All cam rods 72, 73 and 74, 75 are moved correspondingly during the described interval in that they are all mounted upon a lower platform 82 upon the columns 57 and 58 and take the vertical movement of said platform 82 along the columns 57 and 58. However, the cam rods 74 and 75 do not cause motion in the slides 55 and 56 and the wire clamping jaws 53 and 54 in that they are so shaped that uniformly shaped portions thereof pass behind the rollers

76 on said slides 55 and 56. The upward movement of the lower platform 82 continues without interruption and next in order causes the jaws 53 and 54 to advance and clamp the ends of the leading-in wires 8 and 9 against jaws 48 and 49, the operation being effected by the advance of cutaway portions 83 (Fig. 5) of less thickness behind the rollers 76 on the slides 55 and 56. The jaws 53 and 54 are influenced in their movement by springs 85 located within pockets therein and bearing against a tongue (not shown) extending downward from the cover plates 86 which hold the slides 55 and 56 in the ways of the platform 52. In instances when the mount 1 or the leading-in wires 8 and 9 are not present, the movement of the jaws 53 and 54 is limited by the engagement of stop screws 94 on the outer ends of the slides 55 and 56 with the edge of the upper platform 52.

The jaw movements resulting from the upward travel of the lower platform 82 along the columns 57 and 58 is under the control of actuating means located below the table 4 as the elevation of said platform 82 is established by a rod 87 extending therebetween. As shown in Fig. 13, the rod 87 is connected to one end of a lever 88 (corresponding to lever 89) on the pivot pin 90 of stationary bracket 91 and is influenced by the engagement of a roller (not shown) on the opposite end thereof with a groove in one face of the cam 92.

During the advance of the clamping jaws 53 and 54 toward the leading-in wires 8 and 9, a certain rebending and repositioning of said wires 8 and 9 occurs as the end of the jaws 53 and 54 engage the said wires 8 and 9, as shown in Fig. 6, while still some distance from the jaws 48 and 49. The rebending of the leading-in wires 8 and 9 occurs when the jaws 53 and 54 force said wires 8 and 9 toward the jaws 48 and 49 and thereby shove the end of said wires 8 and 9 further downward between the coating faces of the jaws 48, 53 and 49, 54 so that bends are made in said wires 8 and 9 midway along their length at points adjacent the upper surface of said jaws. The notched end of a stationary finger 93 (Figs. 4, 6, and 7), which is located over the clamping jaws 53 and 54, prevents the midportion of the wires 8 and 9 from bowing upward during the closing movement of the jaws 53 and 54 and cooperates with the notched guides 94 on said jaws 53 and 54 in keeping the leading-in wires 8 and 9 properly aligned. When the jaws 53 and 54 finally press the leading-in wires 8 and 9 against the jaws 48 and 49, the bend at 95 in the end portions of said wires 8 and 9 is completely straightened out and said wires 8 and 9 are gripped as in Fig. 7. The ends of the leading-in wires 8 and 9 at such times extend below the jaws 48 and 49 and are at a position considerably closer to the axis of the mount than formerly.

The next operation of the leading-in wire reforming device 21 is an upward movement of all four jaws 48, 49, 53 and 54 created by a corresponding movement of the upper platform 52 and rebends the leading-in wires 8 and 9 so that the ends thereof holding the filament 14 are placed directly opposite the button in the end of the arbor 10. During the aforesaid bending operation the leading-in wires 8 and 9 bend adjacent the arbor 10 and at intermediate points just above the jaws 48 and 49 so that they then have a form known as loop-back construction. The upper platform 52 is moved vertically by a rod 96 extending to operating means located below the table 4 and is moved sufficiently to complete the

desired rearrangement of the leading-in wires 8 and 9 when its motion is interrupted by the stop collar 97 on the upper end of the column 58. During the above motion of the upper platform 52, the jaws 48, 49, 53, and 54 continue to maintain their relative relation in that the rollers 76 move over portions of the cam rods 72, 73, 74, and 75 of uniform shape. The operating means connected to the upper platform 52 by the rod 96 effects motion therein on the basis of variations in the position of the portion of the track 98 in the face of the cam 92 engaged by the roller 99 on one end of the lever 89, which lever 89 is connected to said rod 96 through the resilient coupling 100. The excess motion occurring in the lever 89 after the platform seats against the collar 97 is absorbed in the compression of a helical spring 101 of the coupling 100 and in separate motion of the rod 102 carrying it into the body 103 thereof. The rod 102 is slidable longitudinally in the body 103 of the coupling to the extent allowed by a laterally projecting pin 104 in a longitudinal slot in said body 103 and is constantly under the influence of the spring 101 which bears against the nuts 105 on rod 102 and the end of the said body 103.

Upon completion of the rebending and repositioning of the leading-in wires 8 and 9, the device 21 separates therefrom and returns to the initial operative position. The clamping jaws 53 and 54 retract first when the return downward movement in the lower platform 82 occurs and are followed in their motion by the retraction of the bending jaws 48 and 49 as said lower platform 82 progresses in the downward movement. Finally, the upper platform 52 is moved down to arrange the jaws 48, 49, 53, and 54 at their initial elevation and the device 21 is rocked backward about the pivot pins 60 and 61 to a position clear of the mount 1 and the path of travel taken in its subsequent advance.

The next station taken by the mount 1 is work station D where the final reduction in the spread of the filament mount is effected by the reformation of the intermediate support wire 12. The index of the turret 3 accounting for the advance of the mount 1 occurs when the support wire reforming device 22 (Figs. 8 and 9) at this station and almost completely covered by the turret 3 is tipped back from the path of the travel of the mount 1 and is followed immediately by a positioning movement of said device 22 which carries it to an upright position and operative relation to said mount 1. The support wire reforming device 22 corresponds to the leading-in wire reforming device 21 at station C in having the essential wire working elements thereof mounted upon an upper platform 107 which is slidable vertically upon two upstanding columns 108 and 109 held by a yoke 110 and in causing said elements to be moved to and from operative relation to the mount 1 by a rocking motion of the yoke-supported assembly about the pins 111 and 112 (the latter only partially shown) in opposite extremities of the stationary bracket 113. The rocking movement of the device 22 is under the control of actuating means located below the table 4 and engaging the lower end of the column 109 which extends through an opening in said table 4. The controlling element of this particular actuating means is the cam 114 on the main cam shaft 5. The contraction force of a spring 115 connected between an extension 116 on the end of column 109 and a post projecting from the lower surface of the table 4 counterbalances

the tendency of the weight of elements mounted upon the yoke 110 to tilt and applies a turning moment to the lever 117 through the link 118 to cause the roller 119 on one end of said lever 117 to seat on the cam 114. Variations in the periphery of the cam 114 turn the lever 117 about a pin 120 carried by a bracket 121 on the stationary frame (not shown).

The operative position of the reforming device 22 is marked by the arrangement of the clamping jaw 122 (Figs. 9 and 10) on one end of the slide 123 at a position directly opposite, and in front of, an intermediate portion of the support wire 12 and by the arrangement of a second bending anvil jaw 124 on one end of the lever 125 at a position closer to the plane of the mount than said intermediate portion of said support wire 12 (i. e., behind the said wire 12). Both the clamping and bending jaws 122 and 124, respectively, are independently movable members having initial positions determined respectively by the longitudinal arrangement of the slide 123 within ways in a carriage 126 and the pivoted position of the lever 125 on pin 127 projecting from said carriage 126, and are under the control of the vertical cam rods 128 and 129 which bear against rollers 130 and 131, respectively, on the adjacent ends of the slide 123 and the lever 125, respectively. The cycle of operation of the reforming device 22 is advanced by a lateral movement of the bending jaw 124 to a position under the arch of the support wire 12 and is caused by the upward movement of a lower platform 132 supporting the cam rods 128 and 129 and presently advancing a cutaway portion (corresponding to that shown as 128' on rod 128, Fig. 8) of the cam rod 129 into engagement with the roller 131 on the lever 125. The motion of the jaw 124 and, accordingly, the lever 125 results from the constant pressure of a plunger 133, which is slidable longitudinally within an upstanding boss of the carriage 126, against the forward end of said lever 125 whereby the roller 131 is caused to bear against the cam rod 129 and swing about the pivot pin 127 when a differently shaped portion of said cam rod 129 is engaged thereby. The force transmitted by the plunger 133 is the straightening force of a leaf spring 134 having one end bearing against the outer end thereof and having the opposite end attached to an adjacent portion of the carriage 126. Although the cam rod 128 is moved correspondingly to cam rod 129, no other operation of the support reforming device 22 occurs during the immediately described motion of the lower platform 132 as at that time a uniformly shaped portion of the cam rod 128 passes behind the roller 130 on the slide 123. The next operation of the support wire reforming device 22 brings the clamping jaw 122 against the support wire 12 with sufficient pressure to force it into engagement with the bending jaw 124 and to clamp it in place thereagainst as shown in Fig. 11. A notched guide 135 on the lower edge of the jaw 122 gathers in the support wire 12 and prevents it from slipping sideward out of position during the forward motion of said jaw 122 which is initiated by further upward movement of the lower platform 132 and the cam rod 128. At that time, a change in the shape of the cam rod 128 passes behind the roller 130 on the slide 123 supporting the jaw 122 and the oppositely acting expansion force of a spring 136 located in a pocket in the slide 123 and butting against a depending tongue (not shown) on the cover plate 137 over slide 123 and lever 125 causes

said slide 123 to advance. The upward motion of the lower platform 132 is under the control of operating means located below the device 22 and connected to said platform 132 by a rod 138 extending through an opening in the table 4 and is produced by movement of a lever 139 about the pivot pin 120 in accord with the advance of a differently positioned portion of a track 140 in the face of cam 141 into engagement with a roller 142 on said lever 139.

Following the rebending and clamping or gripping of the support wire 12 between the jaws 122 and 124 as shown in Fig. 11, an upward movement of both jaws 122 and 124 occurs which carries them to the position shown in Fig. 12 and by so doing wraps the intermediate portion of the support wire 12 over the top of bending jaw 124 and relocates the looped end thereof holding the filament 14 at a position opposite the end of the glass arbor 10. The present upward motion of the jaws 122 and 124 is produced by corresponding motion of the upper platform 107 along the columns 108 and 109 and continues in the latter until it is seated against the stop collar 143 on the column 109. At some intermediate time, however, the adjoining portion of the support wire 12 becomes taut and interrupts the motion of the jaws 122 and 124 whereupon the continuing motion of the platform 107 is absorbed in a tilt of the carriage 126 about the pivot pins 144 in the back portion thereof. The forward edge of the carriage 126 is normally held at a raised position above the platform 107 as shown in Fig. 8 by the frictional engagement of a block 145 within a horizontal passage in the boss 146 on the forward edge of said platform with a post 147 extending downward from the forward edge of the carriage 126. When the support wire 12 is pulled taut, however, the resistance of the jaws 122 and 124 to upward motion is such that the post 147 is slid along the face of the friction block 145. A helical spring 148 and the adjusting screw 149 which are located behind the friction block 145 allow the pressure of engagement between said block 145 and the post 147 to be set so that a definite tautness is created in the support wire 12 to set the bend therein and yet avoid damage to said support wire 12 and arbor 10.

The upward movement of the carriage 107 bending the support wire 12, and the relative positions taken by the carriage 107 are under the control of actuating means located below the table 4 and connected thereto through the rod 150. As shown in Fig. 13, the rod 150 is connected through the coupling 151 to a lever 152 corresponding to the adjacent operating lever 99 and is influenced vertically by movement of the lever 152 about the pivot pin 153 on the stationary bracket 154 in accord with the advance of differently positioned portions of a track (not shown) on the far side of the cam 141 into engagement with a roller (also not shown) on the opposite end of the lever 152. The excess movement of the lever 152 occurring after the upper platform 107 seats against the stop collar 143 forces the push rod 155 attached to said lever 152 up into the body 156 of the coupling 151 and is absorbed in compressing the helical spring 157 located around the lower end portion of the push rod 155 between said body 156 and nuts 158 on said push rod 155. A cross pin 159 within the upper end of the push rod 155 and slots in the body 156 prevents the expansion force of the spring 157 from pulling the push rod 155 com-

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pletely from said body 156 at other times during the operative cycle.

The above-described support wire bending and setting functions of the reforming device 22 complete the operative functions effecting the support wire 12 and are followed by separation movements of the bending and clamping jaws 122 and 124 and a backward tipping movement of the device 22 about the pivot pins 111 and 112 to clear all parts of said device from the mount 1. A return downward movement of the lower platform 132 under the control of the operating means causes the bending and clamping jaws 122 and 124 to be withdrawn from engagement with the support wire 12 without disturbing the position thereof. The tipping movement of the device which follows is also under the control of the operating means and removes all portions of said device from the path taken by the mount 1 in the immediately occurring indexing movement thereof carrying it to another work station. At that time, the reforming device 22 has still to prepare for the succeeding cycle of operation by bringing the jaws 122 and 124 to their initial height.

The first part of the relocation of the jaws 122 and 124 occurs immediately and is effected by a lowering movement of the upper platform 107 which positions it at the proper height on the columns 108 and 109. The support carriage 126 for the jaws 122 and 124 is still at the lowered position close to the top surface of the upper platform 107 and must be raised to its initially taken position. This latter operation completes the rearrangement of the jaws 122 and 124 but does not occur until the reforming device 22 has tilted forward in the succeeding cycle of operation. The carriage 126 is raised to its initial position above the upper platform 107 by the actuation of reset means 160 (Figs. 1 and 9) permanently located before the reforming device 22 and is accurately controlled to avoid unnecessary pull upon the support wire 12 during the reformation thereof. The reset means pushes the carriage 126 upward by raising the arm 161 into engagement with the head of the bolt 162 on the lower end of the post 147 and then pushing said bolt 162 and post 147 upward the required amount to displace said carriage 126. Control over the movement lies in operating means for the push rod 163 supporting the arm 161 and a stop nut 164 on an upstanding post 165 extending from the support standard 166 which nut 164 is engaged by an ear 167 on the arm 161. The actuating means is located below the table 4 and moves the push rod 163 vertically within bearings in the support standard 166 in accord with the movement of the cam actuated lever 139 to which it is connected by the coupling 168, rod 169 and a yoke 170. The lever 139 has greater movement than required to raise the push rod 163 sufficiently to carry the arm 161 against the stop nut 164 and causes the yoke 170 to slide upward along rod 169 and to compress the spring 171 located between it and the fixed collar 172 on the rod 169 at the limit of motion. At other times, a fixed collar 173 on the lower end of the rod 169 prevents the expansion force of the spring 171 from changing the relation of the yoke 170 and said rod 169. Inasmuch as it is very desirable to know and check with considerable accuracy the amount of upward displacement of the jaws 122 and 124 by the reset means 160, a pointer 174 and scale 175 are incorporated therein to show the limit of this motion. The pointer 174 which

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is attached to a pivot pin 176 in an extending bearing 177 of the standard 166 is only displaced when the upward movement of the arm 161 nears the limit of its motion and carries the second ear 178 thereof against the laterally extending portion 179 of the pointer 174. The motion resulting in the pointer 174 turns it in a clockwise direction against the bias of the contraction force of a helical spring 180 extending between posts in the standard 166 and the portion 179 of the pointer 174 and moves it sufficiently to show a relative displacement with respect to markings on the scale 175. Normally, it is desirable to cause the indicating means comprising the pointer 174 to be inoperative at other times so that the ear 178 of arm 161 does not constantly strike against the portion 179 of pointer 174; and, accordingly, facilities are provided in a thumb nut 181 threaded onto the end of the pivot pin 176 for frictionally clamping said pointer 174 to the face of the bearing 177 at an inoperative position.

Although a preferred embodiment of our invention has been disclosed, it will be understood that the invention is not to be limited to the specific construction and arrangement of parts shown, but that they may be widely modified within the spirit and scope of our invention as defined by the appended claims.

We have shown and particularly described certain embodiments of our invention and certain methods of operation embraced therein for the purpose of explaining its principle and showing its application. It will be obvious to those skilled in the art that many modifications are possible without departing from our invention, and we aim, in the appended claims to cover all such modifications and variations as fall within the true scope of our invention.

The method of manufacturing a mount as disclosed herein is not claimed in the instant case but is separately claimed in our divisional application Serial No. 295,463, filed June 25, 1952.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In a machine for making electric lamp mounts comprised of a stem, leading-in and support wires spreading from the stem to spaced positions in a transverse plane adjacent one end thereof and a generally U-shaped filament located within said plane and attached to the free end portions of said leading-in and support wires, the combination of a carrier having thereon a plurality of heads for holding the mounts and advancing them with the filament lowermost to work stations, a wire reforming device located at a work station adjacent said carrier and comprising a horizontally arranged bending jaw movable upward against and beyond the position occupied by an intermediate portion of said one of the wires with the jaw surface extending laterally of the wire to cause said wire to bend adjacent the stem and be repositioned, and said reforming device also including a clamping jaw movable laterally against the opposite side of an end portion of the wire from the bending jaw to cause said intermediate portion to bend around the bending jaw, and the end portion and the portion of the filament held thereby to be re-located nearer the stem, means for moving said jaws as aforesaid, and means for operating the device in timed relation to the movements of the carrier and the advance of the stem to the aforesaid station.

2. In a machine for making electric lamp

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mounts comprised of a stem, leading-in and support wires spreading from the stem to spaced positions in a transverse plane adjacent one end thereof and a generally U-shaped filament located within said plane and attached to the free end portions of said leading-in and support wires, the combination of a carrier having thereon a plurality of heads for holding the mounts and advancing them with the filament lowermost to work stations, a wire reforming device located at a work station adjacent said turret and comprising vertically movable jaw support means positioned opposite and intermediate portion of the leading-in and support wires, a pair of jaws movable laterally across the support means to extend laterally of and in gripping engagement with opposite sides of one of the wires, means for actuating said jaws as aforesaid, and means for moving the support means upward to cause the wire to be bent, and the end portion thereof and the portion of the filament held thereby to be relocated nearer the stem, and means for operating the device in timed relation to the movements of the carrier and the advance of the stem to the aforesaid station.

3. In a machine for making electric lamp mounts comprised of a stem, leading-in and support wires spreading from the stem to spaced positions in a transverse plane adjacent one end thereof and a filament located within said plane and attached to the free end portions of said leading-in and support wires, the combination of a carrier having thereon a plurality of heads for holding the mounts and advancing them with the filament lowermost to work stations, a wire reforming device located at a work station adjacent said carrier and comprising vertically movable jaw support means positioned opposite an intermediate portion of the leading-in and support wires, a pair of jaws, one slidable and the other pivoted for movement laterally across the support means to extend laterally across and in gripping engagement with opposite sides of one of the wires, jaw operating means comprising vertical cam rods varying in size lengthwise and engaging portions of the jaws, and means for moving the cam rods vertically to cause differently formed portions thereof to engage the jaws and cause them to grip the wire, and means for thereafter moving the support means upward to cause the jaws to bend the wire and relocate the end portion thereof and the portion of the filament held thereby nearer the stem, and means for operating the device in timed relation to the movements of the carrier and the advance of the stem to the aforesaid station.

4. In a machine for making electric lamp mounts comprised of a stem, leading-in and support wires spreading from the stem to spaced positions in a transverse plane adjacent one end thereof and a filament located within said plane and attached to the free end portions of said leading-in and support wires, the combination of a carrier having thereon a plurality of heads for holding the mounts and advancing them with the filament lowermost to work stations, a wire reforming device located at a work station adjacent said carrier and comprising vertically movable jaw support means positioned opposite an intermediate portion of the leading-in and support wires, a bending jaw movable across the support means to a position laterally across and behind one of the wires, a clamping jaw movable across the support means and against the opposite side of the wire to clamp said wire against

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the bending jaw and bend it to conform thereto, means for actuating said jaws as aforesaid, a finger mounted on the support means and extending to a position over the clamping jaw to block the upward movement of the wire from between the jaws, and means for moving the support means upward to cause the jaws to bend the wire and relocate the end portion thereof and the portion of the filament held thereby nearer the stem, and means for operating the device in timed relation to the movements of the carrier and the advance of the stem to the aforesaid station.

5. In a machine for making electric lamp mounts comprised of a stem, leading-in and support wires spreading from the stem to spaced positions in a transverse plane adjacent one end thereof and a filament located within said plane and attached to the free end portions of said leading-in and support wires, the combination of a carrier having thereon a plurality of heads for holding the mounts and advancing them with the filament lowermost to work stations, a wire reforming device located at a work station adjacent said carrier and comprising, a pair of jaws movable into positions across and in engagement with opposite sides of an intermediate portion of one of the wires to cause said portion to be gripped therebetween, means for actuating said jaws as aforesaid, upwardly movable support means for the jaws, and means for raising the support means under controlled pressure to cause the jaws to carry the intermediate portion of the wire upward until the immediately adjoining portion adjacent the stem becomes taut so as to relocate the end portion of said wire and the portion of the filament held thereby nearer the stem, and means for operating the device in timed relation to the movements of the carrier and the advance of the stem to the aforesaid station.

6. In a machine for making electric lamp mounts comprised of a stem, leading-in and support wires spreading from the stem to spaced positions in a transverse plane adjacent one end thereof and a filament located within said plane and attached to the free end portions of said leading-in and support wires, the combination of a carrier having thereon a plurality of heads for holding the mounts and advancing them with the filament lowermost to work stations, a wire reforming device located at a work station adjacent said carrier and comprising a pair of jaws movable into positions across and in engagement with opposite sides of an intermediate portion of one of the wires to cause said portions to be gripped therebetween, means for moving the jaws as aforesaid, support means for the jaws comprising a vertically movable platform, a carriage pivoted for vertical movement upon the platform about a horizontal axis at a position remote from the wire gripping portions of the jaws holding said wire, and friction controlled means engaging the portion of the carriage near the gripping portions of the jaws and the platform for supporting the former in relation to the latter, and means for raising the support means to cause the jaws to carry the intermediate portion of the wire upward so as to relocate the end portion thereof and the portion held thereby, the motion being interrupted when the adjoining portion of said wire becomes taut and the carriage turns about the pivot against the resistance of the friction controlled means, and means for operating the device in timed relation to the movements of the

carrier and the advance of the stem to the aforesaid station.

7. In a machine for making electric lamp mounts comprised of a stem, leading-in and support wires spreading from the stem to spaced positions in a transverse plane adjacent one end thereof and a filament located within said plane and attached to the free end portions of said leading-in and support wires, the combination of a carrier having thereon a plurality of heads for holding the mounts and advancing them with the filament lowermost to work stations, a wire reforming device located at a work station adjacent said carrier and comprising, a pair of jaws movable into positions across and in engagement with opposite sides of an intermediate portion of one of the wires to cause said portion to be gripped therebetween, means for moving the jaws as aforesaid, support means for the jaws comprising a vertically movable platform, a carriage supporting said jaws and pivoted for vertical movement upon the platform about a horizontal axis at a position remote from the wire gripping portions of the jaws, and friction controlled means engaging the portion of the carriage near the gripping portions of the jaws and the platform for supporting the former in relation to the latter, and means for raising the support means to cause the jaws to carry the intermediate portion of the wire upward so as to relocate the end portion thereof and the portion held thereby, the motion being interrupted when the adjoining portion of said wire becomes taut and the carriage turns about the pivot against the resistance of the friction controlled means, reset means for pushing the carriage to the initially taken position above the platform during the succeeding operating interval, and means for operating the device in timed relation to the movements of the carrier and the advance of the stem to the aforesaid station.

8. In a machine for making electric lamp mounts comprising a stem having leading-in and

support wires radiating outwardly therefrom and attached at their free ends to a filament lying substantially in a plane transverse to the axis of said stem, the combination of a movable carrier having thereon a plurality of heads for holding the mounts vertically and with the filaments lowermost and for carrying the mounts to successive work stations, and a re-forming device at one of said stations adjacent the path of movement of said heads and comprising support means, an anvil jaw and a clamping jaw movably mounted on said support means, means for moving said anvil jaw to a position transversely across and behind an intermediate portion of one of said wires, means for carrying said clamping jaw toward said anvil jaw to clamp said portion of the wire between said jaws, means for moving said support means and jaws upwardly in unison a distance sufficient to carry the jaws beyond the point of emergence of said wire from its associated stem to bend the wire about both said anvil jaw and the stem, and means for actuating said re-forming device in synchronism with the movement of said carrier.

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