

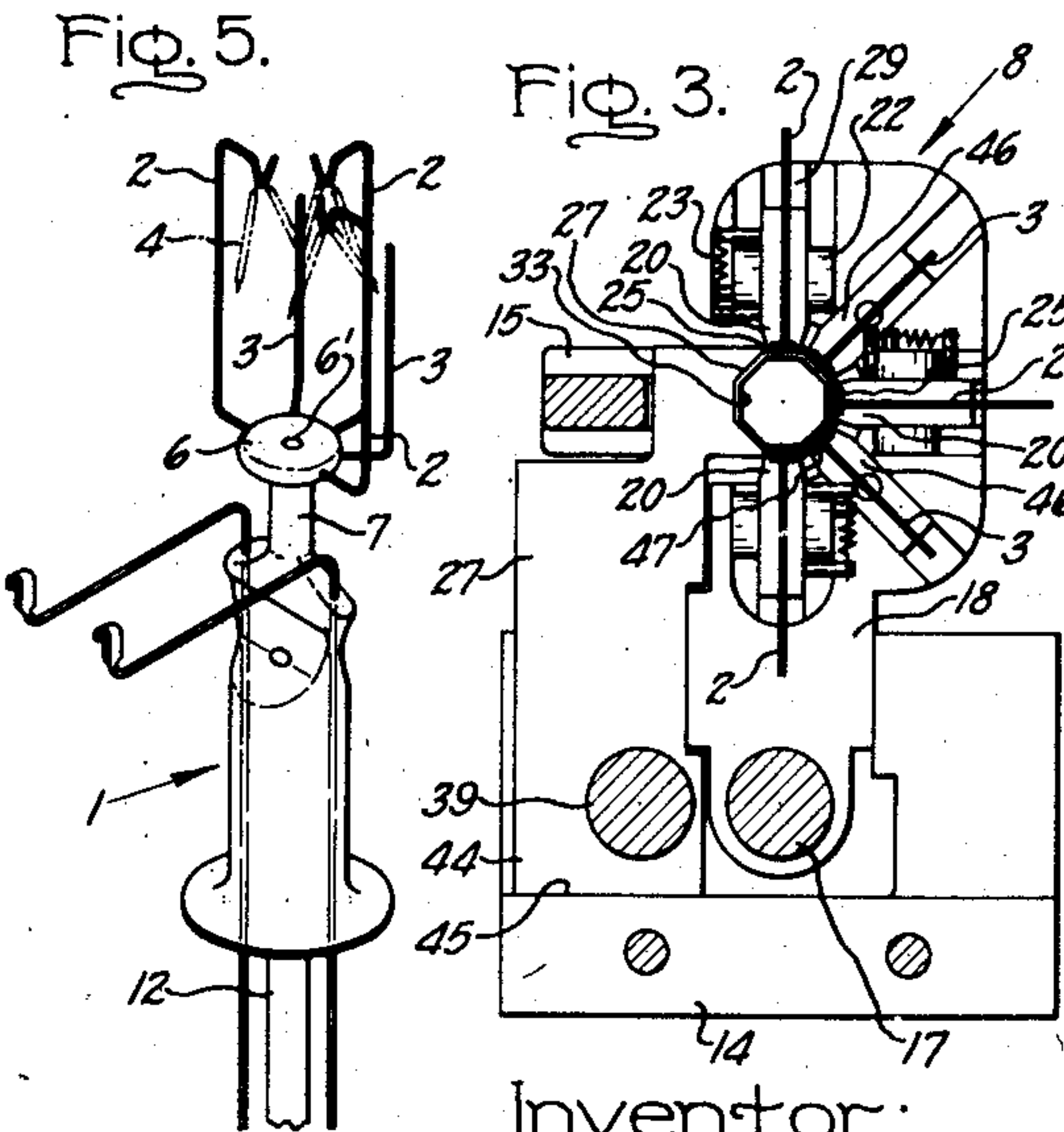
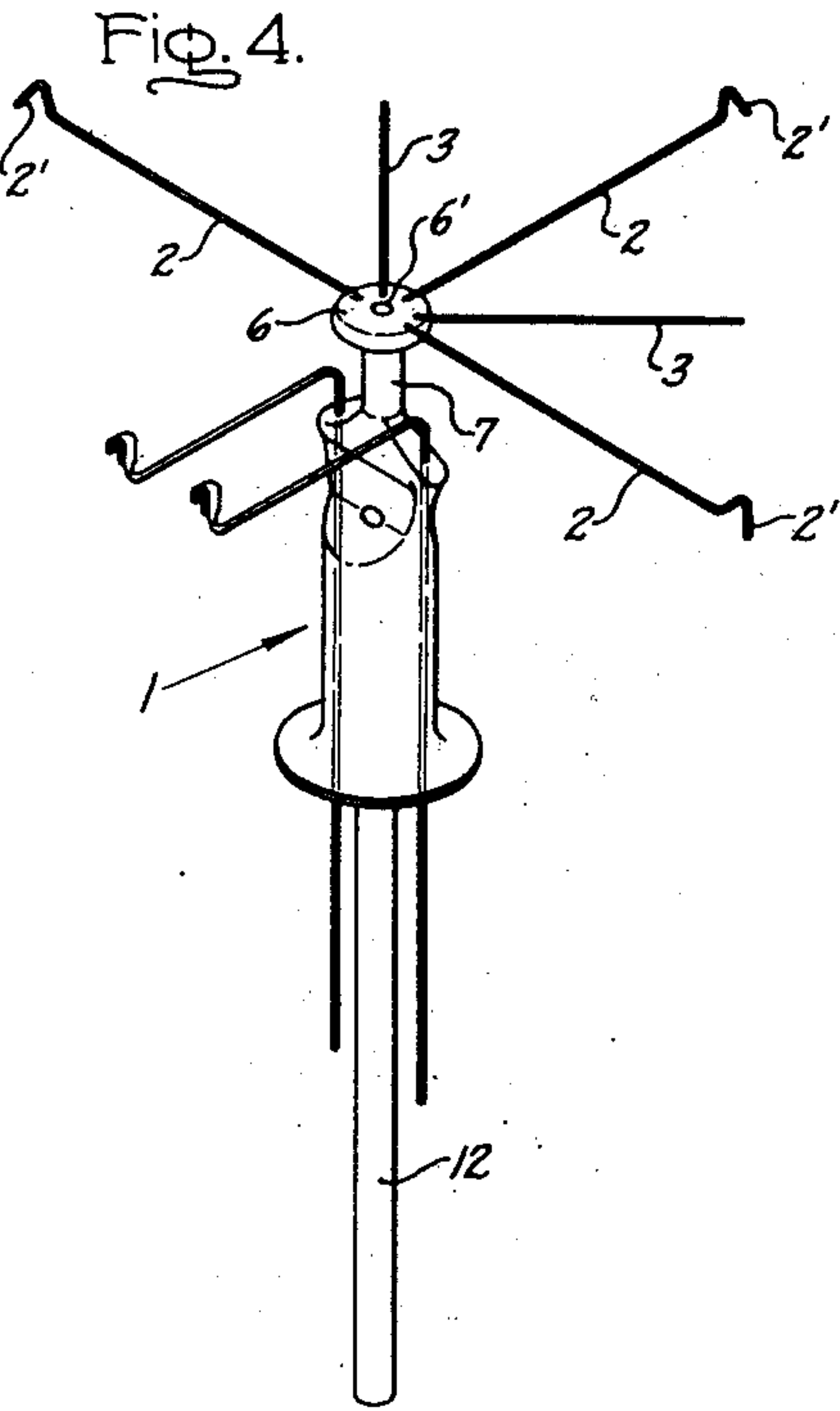
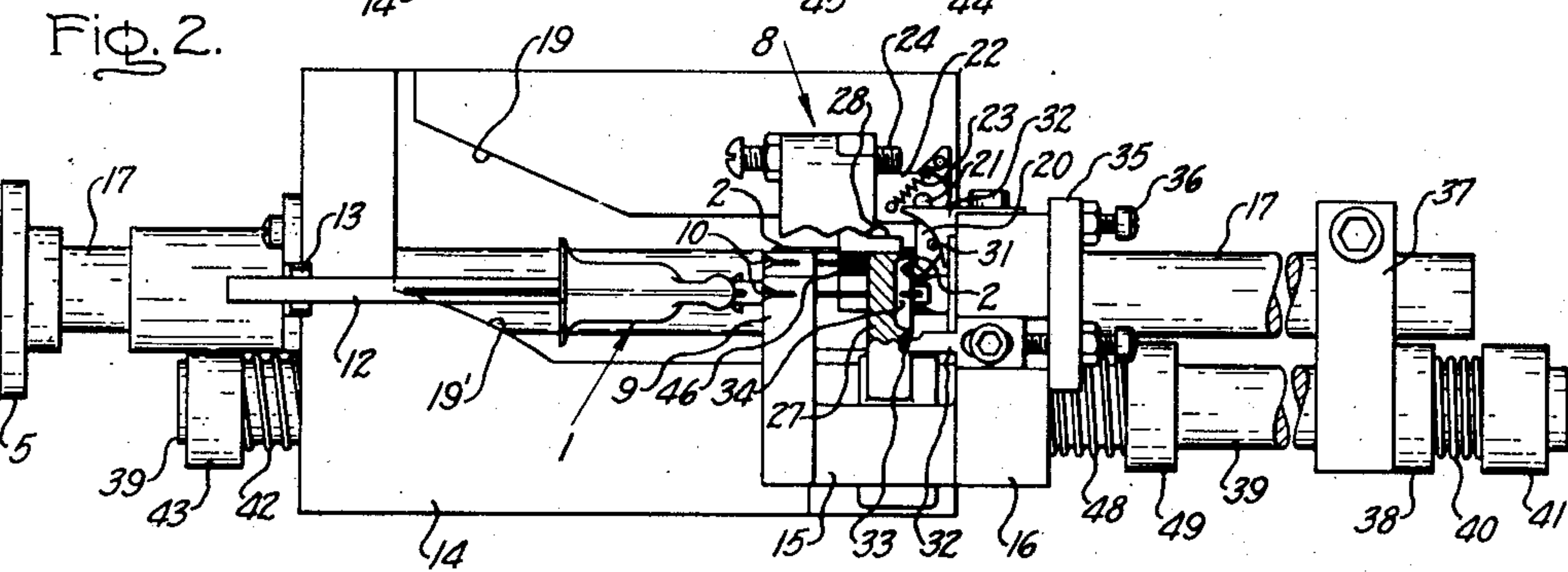
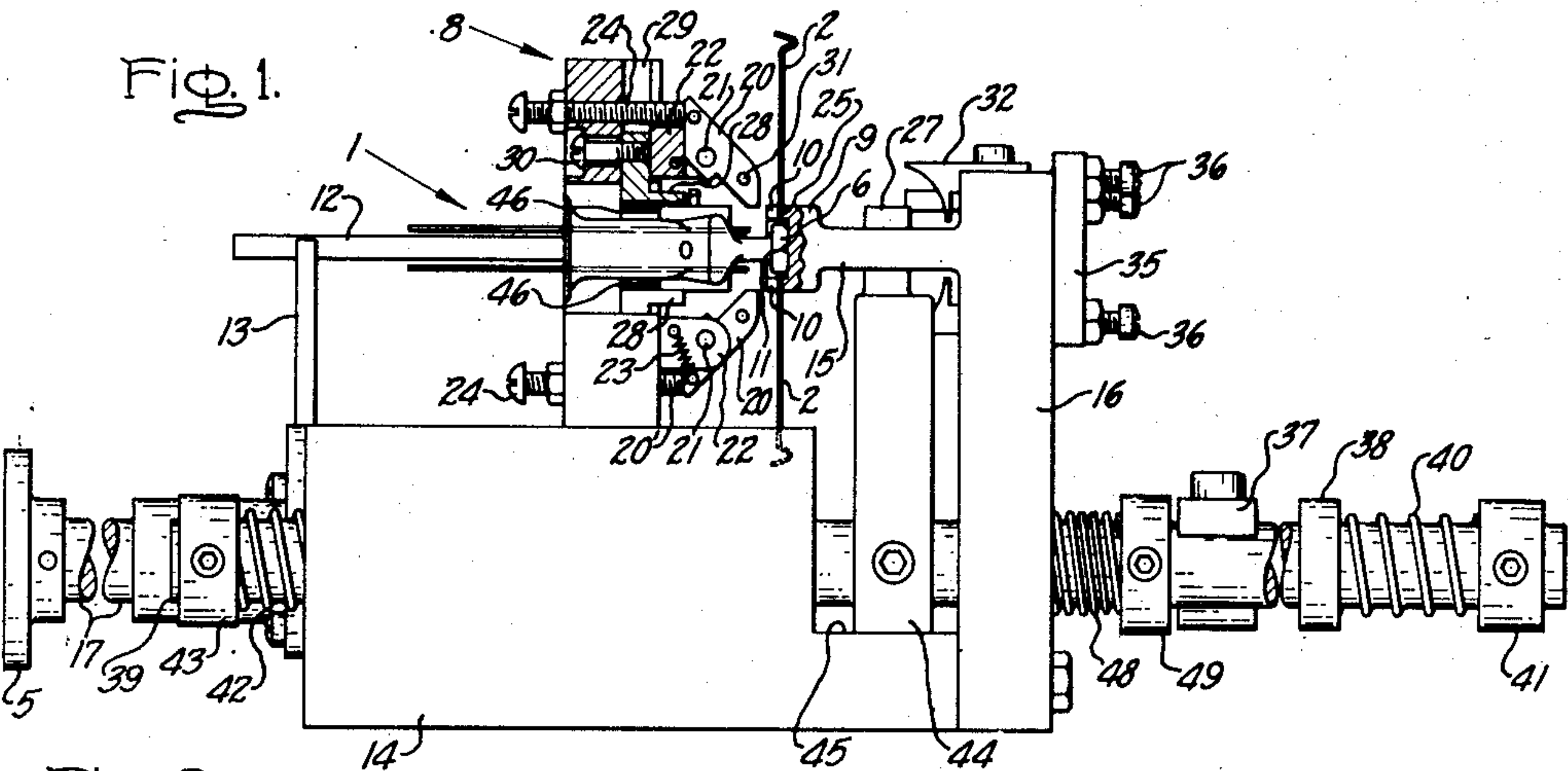
Sept. 29, 1953

C. T. VAUGHAN

2,653,631

SUPPORT WIRE FORMING APPARATUS

Filed July 23, 1948



Inventor:
Clayton T. Vaughan,
by Vernet P. Kauffman
His Attorney.

UNITED STATES PATENT OFFICE

2,653,631

SUPPORT WIRE FORMING APPARATUS

Clayton T. Vaughan, Circleville, Ohio, assignor
to General Electric Company, a corporation of
New York

Application July 23, 1948, Serial No. 40,325

3 Claims. (Cl. 140—71.6)

1

My invention relates to the manufacture of incandescent lamps and more particularly to apparatus for bending a group of filament support wires, extending radially from a portion of a stem, into a predetermined form and spacing.

The manufacture of the filament-supporting structure for certain types of incandescent lamps, such as those for train headlight and spotlight service, includes the step of bending an unusually complex and closely held grouping of support wires. The support wires are bent into an arrangement which is particularly well suited to hold a relatively long coiled filament in a manner to provide a desired optical effect as well as to provide a high bump resistance to the lamp, and involves the bending, at spaced points along their length, of support wires extending radially from a supporting element. Because of the complexity of the bending operation, it has not heretofore been performed in its entirety by mechanical means.

One object of my invention is to provide apparatus for bending a complex grouping of support wires extending radially from a vitreous button of a stem part to definite positions endwise thereof. The function of the support wires in the incandescent lamp here involved is to retain the various sections or segments of a relatively concentrated filament at definite locations within a limited zone usually in axial alignment with the stem and beyond the vitreous button at the end of the stem. The bending operation consists in bending certain of the support wires so they extend axially outward to support the concentrated filament at points remote from the button, while other support wires are bent to support the filament at points adjacent to the button.

Another object of my invention is to provide apparatus for bending a group of radially extending filament support wires held by a lamp stem or other supporting structure, which apparatus is characterized by bending means movable to and from a position about said lamp stem and in proper operative relation to said filament support wires. The above apparatus eliminates to a great extent the difficulties of positioning the group of support wires and the lamp stem in the bending apparatus, promotes greater accuracy and eliminates many of the usual steps in the bending operation. The apparatus comprising my invention is equally useful as a bench type device or in combination with automatically operated means advancing the stem with its grouping of support wires into operative relation to the bending apparatus and actuating said ap-

2

paratus in proper synchronism with said movements. The latter automatic apparatus may be one of the combination stem and inserting machines or automatic mount-making machines, as in U. S. Patent 1,907,532, J. Flaws, dated May 9, 1933, in which the more common form of incandescent lamp is manufactured and in which the present bending apparatus may occupy one of the work stations thereof.

Other objects and advantages of my invention will appear from the following detailed description of a species thereof and from the accompanying drawing.

In the drawing, Fig. 1 is a side elevation of a bench-type support wire bending apparatus comprising my invention, with an overlying corner of the bending or forming head broken away, the operating mechanisms being shown in a position taken immediately after the start of its cycle of operation; Fig. 2 is a plan view of said apparatus, with a somewhat similar corner section taken therefrom, and the operating mechanisms being at a position taken in completing the bending operation; Fig. 3 is an end view of the said apparatus taken from a section formed by the removal of the fixed support head and the adjacent ends of the operating rods at the right end thereof; Fig. 4 is a perspective view of a lamp stem having a grouping of support wires adapted to be bent by the above apparatus, and Fig. 5 is a corresponding perspective view of the lamp stem after the support wires thereof have been bent to shape by said apparatus.

The apparatus shown in the drawing is a manually operated bench-type device particularly adapted to receive a lamp stem 1 and to bend the three long and two short support wires 2 and 3, respectively, extending therefrom, to positions which facilitate the mounting of a filament (like that indicated at 4 in Fig. 5) in a definite relation on said stem 1. The apparatus is preferably mounted upon a table (not shown) before an operator, whose function is to insert the lamp stem 1 into the apparatus, to operate said apparatus by pushing and then retracting the knob 5 and then removing the completed stem from the apparatus. In the complete cycle of operation of the apparatus, the support wires 2 and 3, which extend radially outward from the vitreous button 6 on the end of the arbor 7 in a single plane transverse to the axis thereof, are bent at intermediate points along their length so as to extend axially of the stem 1 to points at which they support respective ends of the coiled segments making up the filament 4. Support wires 2, for instance,

3

are bent at points a short distance from the button 6 and again at points relatively near their ends so as to extend axially beyond the filament 4 and then over into engagement with respective segments thereof. Support wires 3, on the other hand, are only bent at points a short distance from the button 6 so as to extend directly to the positions at which they support the opposite ends of the filament segments. In the subsequently occurring lamp-making operations not associated with this invention, the ends of the support wires 3 are bent into proper position to engage with the filament 4. Inasmuch as the longer support wires 2 are provided with open hooks 2' prior to the time they are bent into shape by the present apparatus, the bending operation associated with said apparatus is directly instrumental in fixing the position of the filament 4 and eliminates the inaccuracies and difficulties of former manufacturing operations wherein the bending operations were performed manually and readjustments were required to assure accuracy in the position of the filament 4.

At the time the lamp stem 1 is placed in the apparatus, the movable bending or forming head 8 is in a retracted position at the left (front) end thereof (Figs. 1 and 2) and is offset from the position shown so as to be entirely clear of the position taken by the lamp stem 1. This arrangement permits more rapid and free insertion of the lamp stem 1 in the apparatus without danger of bumping the support wires 2 and 3 against some part thereof. The operator inserts the arbor end of the stem 1 first by directing the button 6 into the cup-shaped opening in the die block 9 and the support wires 2 and 3 extending therefrom into notches 10 in the rim of said die block 9. The stem 1 must be so directed that the cavity 6' in the end of the button 6 is engaged by a centering projection 11 and butts against the surrounding area of the die block 9, and must be orientated so that the support wires 2 and 3 are all to one side of the stem 1 and fall into specifically positioned notches 10 in the die block 9. The final stem-inserting movement consists in resting the exhaust tube 12 in a cleft or notch in the upper end of the post 13 which is fastened to the end of the bed 14 of the apparatus and positions said stem 1 along a definite operating axis of said apparatus. The stem 1 retains this fixed position throughout the period of operation of the apparatus inasmuch as the die block 9 is located in the end of an angular arm portion 15 extending parallel with and then laterally of the operating axis from the fixed head 16 which is attached to the opposite end of the bed 14 of the apparatus.

The first step in the cycle of operation of the apparatus is an advancing movement of the bending head 8 which carries it laterally into alignment with the operating axis of the apparatus and longitudinally therealong to a position about the main portion of the stem 1, the position in which the bending head 8 is shown in Fig. 1. The advancing movement is produced manually by pressure against the control knob 5 at the end of the operating rod 17 such that a longitudinal motion is produced in said rod 17 which develops a corresponding motion in the bending head 8 as said bending head 8 is mounted thereon through an extended portion 18 gripping the mid-portion of said rod 17. The lateral component of the movement of the bending head 8 occurs as the extended portion 18 thereof, which lies between the angularly set cam faces 19 and 19' of the bed 14, is directed to a vertical position thereby and

4

swings the bending head 8 over the stem 1. In this latter position the movable bending fingers 20 and other bending means of the head 8 are spaced along the operating axis from the stationary die block 9 and the support wires 2 and 3 of the stem. The fingers 20 are mounted in radial planes intersecting at an axis of the head 8 which is coincident with the operating axis of the apparatus when the said head is in its upright position.

The succeeding step in the operation of the apparatus is an axial movement of the bending head 8 which advances it to the right and which causes the movable bending fingers 20 to engage and wipe the outwardly extending end portions of the support wires 2 over the rim and outer face of the stationary die block 9. This movement of the bending head 8 is produced by continued manual pressure on the knob 5 and the resulting additional longitudinal movement of the operating rod 17.

The particular bending head 8 disclosed is provided with three movable bending fingers 20 corresponding to the three long support wires 2 which are to be bent thereby, but can be constructed in a like manner with other bending fingers if a different grouping or differently positioned support wires are to be bent. In the upright position of the head 8 each movable bending finger 20 lies in a plane which includes the operating axis of the apparatus and the wire 2 it is to bend, and is pivoted on a pin 21 held between upstanding portions of a bracket 22 which is fastened in a radially extending groove in the bending head 8. Each bending finger 20 is constantly under the influence of the contraction force of a spring 23 which extends between posts in said finger 20 and the bracket 22 and, at the moment of engagement with the support wire 2, is biased so that a heel portion 20' thereof rests against the end of an adjusting screw 24 carried by the bending head 8. This position is retained by the bending finger 20 during the advance of the bending head 8 and is such that the outer end or tip of the finger just clears a cooperating plane surface 25 on the outer (octagonal) face of the die block 9 and bends the support wire 2, which falls into a channel in the tip end of the finger 20, against said plane surface 25. Both the end of the finger 20 and that portion of the outer face of the die block 9 on either side of the support wire 2 represented by the plane surface 25 lie in a plane perpendicular to said support wire 2 and parallel to the operative axis of the apparatus. In wiping the support wires 2 into engagement with the plane surfaces 25 of the die block 9, the bending fingers 20 also cause the end portions of said support wires 2 to fall along corresponding cooperative plane surfaces on the outer face of a movable die block 27.

A further step in the bending operation occurs when the hold-down fingers 28, which are disposed radially inward from the movable bending fingers 20 on the bending head 8, pass over the plane surfaces 25 of the die block 9 and that portion of the support wire 2 lying thereagainst, as said bending fingers are then relieved of holding the support wires 2 thereagainst. The support wires 2 lie in channels in the faces of the hold-down fingers 28 adjacent the die block 9 corresponding to those in the bending fingers 20 and are held in their bent positions along the face of the die block 9 since said hold-down fingers 28 are fixed members mounted by means of angular

5

portions thereof located in the channels 29 in the bending head 8 and fastened thereto by screws 30.

The final step in the bending of the support wires 2 occurs when the axial advance of the bending head 8 carries the pins 31 protruding from one side of each of the bending fingers 20 against the concave surfaces of the cams 32 on the fixed head 16 whereby said bending fingers 20 are rocked so as to bend the end of the support wires 2 over the rear edge of the movable die block 27 as shown in Fig. 2. The bending fingers 20, which turn about the pins 21 against the resistance of the springs 23, are moved in a manner causing the ends thereof to pass over the rim 33 of the movable die block 27 and are of such a length that they do not engage the hooks 2' in the ends of the support wires 2, which hooks enter the cavity 34 in the center portion of said movable die block 27. A plate 35 attached to the fixed head 16 and screws 36 behind each of the cams 32 permit ready adjustment of the cams and, accordingly, the rocking movement of the bending fingers 20.

During the latter part of the final bending movement of the fingers 20, the motion of the operating rod 17 also creates a corresponding axial movement in the movable die block 27 which assists the bending finger 20 in making and setting a right-angle bend in the support wire 2. The movement of the operating rod 17 advancing the bending head 8 so as to rock the bending fingers 20 carries the extended end portion of a clamp 37, which is attached to the end of the operating rod 17 opposite knob 5, against the collar 38 about the end of the auxiliary operating rod 39 and thereby creates a longitudinal movement in the auxiliary operating rod 39 and a correspondingly directed motion in the movable die block 27 which is mounted thereon. A spring 40 is located between the collar 38, which slides freely on the auxiliary operating rod 39, and a second collar 41 fastened directly thereto so as to absorb the excess motion of the clamp 37 after the movable die block 27 has pressed the support wire 2 tightly against the bending finger 20. Further cushioning of the movement of the operating rod 17 and auxiliary operating rod 39 is effected by the spring 42 located on the end of said auxiliary operating rod 39 adjacent the knob 5, which spring 42 is normally slightly contracted between the end of the bed 14 and the collar 43 on said auxiliary operating rod 39. Proper alignment between the movable die block 27 and the operating axis of the apparatus is assured by the guiding influence exerted by the engagement of the heel 44 (Fig. 1) of said movable block 27 with the adjacent flat surface 45 of the bed 14.

Midway in the bending movement of the bending head 8 and just prior to the time the final bend is made in the support wires 2, a pair of fixed bending fingers 46 (Fig. 3) are advanced by said bending head 8 to a point where they wipe the shorter support wires 3 over the outer face of the stationary die block 9. This operation lays the end portions of the support wires 3 along plane surfaces 47 on the outer face of the stationary die block 9 and makes a right-angle bend in said support wires 3. The fixed bending fingers 46 lie within grooves in the bending head 8 between the bending fingers 20 and are grooved at their tip ends to accommodate the support wires 3. The bending portion of the cycle of operation of the apparatus is complete when the final bend previously described

6

has been made in the support wires 2 by the fingers 20, and the movement of the operating rod 17 is terminated.

The retraction of the bending head 8 from engagement with the support wires 2 and 3 and to a position completely separated from the stem 1 is brought about immediately after the bending operation by the manual retraction of the operating rod 17. In this interval during which the bending head 8 moves directly to the left (Figs. 1 and 2), the movable bending fingers 20 again rock outwardly until their heel portions rest against the stop screw 24 and then move back along the support wires 2. The pressure of the clamp 37 against the collar 38 on the auxiliary operating rod 39 is also relieved at this time allowing said rod 39 and the movable die block 27 to move in a corresponding direction. The motion of the movable die block 27 is brought about by the expansion of the spring 42 and is terminated when the expansion force of the spring 48, located on the opposite end of the auxiliary operating rod 39 between the collar 49 thereon and the fixed head 16, balances the further expansion of said spring 42. The effect of the motion of the die block 27 is to retract it sufficiently from the hooked ends of the support wires 2 to permit the stem 1 and support wires 2 and 3 to be more readily removed from the apparatus. The retraction of the bending head 8 also slides the hold-down fingers 28 and the fixed bending fingers 46 back along respective support wires 2 and 3 and finally retracts the extended portion 18 thereof to a position between the cam faces 19 and 19' of the bed 14 which swings it sideward from the operation axis of the apparatus to a completely out-of-the-way position. Manual removal of the stem 1, which now has support wires 2 and 3 shaped as shown in Fig. 5, completes the cycle of operation of the apparatus.

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

1. Apparatus for bending a group of filament support wires extending radially outward from an end of a lamp stem, comprising a bed portion, a fixed die block and a movable die block supported from said bed portion and spaced apart along an operating axis spaced from said bed portion, means to support a lamp stem in said axis with its said end abutting against the front end of said fixed die block and its support wires projecting beyond the sides of said die block, an open-sided hollow-centered bending head having thereon fixed bending fingers and movable bending fingers mounted for pivotal movement in radial planes intersecting at an axis at the hollow center of said head, means mounting said head from said bed portion in spaced axial relation to said fixed die block, means to cause movement of said bending head from a position laterally offset from said operating axis to a position centered about said axis and the stem therein and thence along said axis across the sides of said fixed and movable die blocks to cause said fixed fingers to engage and bend said support wires about said die blocks, means to cause said movable fingers to pivot radially inward when they have moved to a position adjacent the rear end of said movable die block to bend the extremities of the wires over the said rear end of the movable die block, means to retract said bending head, and means operative upon retraction of the bending head for moving the movable die block along said operat-

7

ing axis toward the fixed die block to permit ready disengagement of the formed wires.

2. In apparatus of the class described, the combination of a bed portion, a fixed die means mounted on said bed portion, a bending head 5 having thereon pivotable bending means and mounted on said bed portion in spaced axial relation to said fixed die means, a movable die means mounted on said bed portion in spaced axial relation to said fixed die means, means to 10 reciprocate the bending head and cause it to move into cooperative relation to said fixed die means and then therebeyond into cooperative relation to said movable die means, means to cause said pivotable bending means to pivot to- ward said movable die means upon movement of the bending head into cooperative relation thereto, and means to reciprocate the movable die means toward the fixed die means upon re- traction of the bending head.

3. In apparatus of the class described, the combination of a bed portion, a fixed die mem- ber mounted on said bed portion, means to sup- port a work piece with wire portions adjacent a face of said fixed die member and projecting be- yond side portions of said die member, a bending head mounted on said bed portion in spaced axial relation to said fixed die member and having thereon fixed bending fingers and pivotable bend- ing fingers, a movable die member mounted on 30 said bed portion in spaced axial relation to said fixed die member, means to reciprocate the bend- ing head and cause the fixed bending fingers

8

thereon to engage said wires and wipe them around the said side portions of the fixed die member and along corresponding side portions of the movable die member, means to cause said 5 pivotable fingers to pivot toward said movable die member to bend said wires thereabout, and means to reciprocate the movable die member toward the fixed die member upon retraction of the bending head.

CLAYTON T. VAUGHAN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
15 155,657	Lewis	Oct. 6, 1874
1,323,143	Abbott	Nov. 25, 1919
1,341,964	Yennett	June 1, 1920
1,527,375	Nystrom	Feb. 24, 1925
1,642,903	Stoakes	Sept. 20, 1927
20 1,666,380	Heinle	Apr. 17, 1928
1,701,250	Young	Feb. 25, 1929
1,718,753	Miller	June 25, 1929
1,816,683	Ledig	July 28, 1931
1,821,894	Otaka	Sept. 1, 1931
25 1,907,532	Flaws	May 9, 1933
2,297,950	Flaws	Oct. 6, 1942
2,380,742	Flaws	July 31, 1945

FOREIGN PATENTS

Number	Country	Date
472,647	Great Britain	Sept. 27, 1937
467,876	Great Britain	June 24, 1937