May 3, 1927. 1,626,658

H. G. ANDERSON

MANUFACTURE OF INCANDESCENT LAMPS

Filed April 29, 1922

FIG. 1.

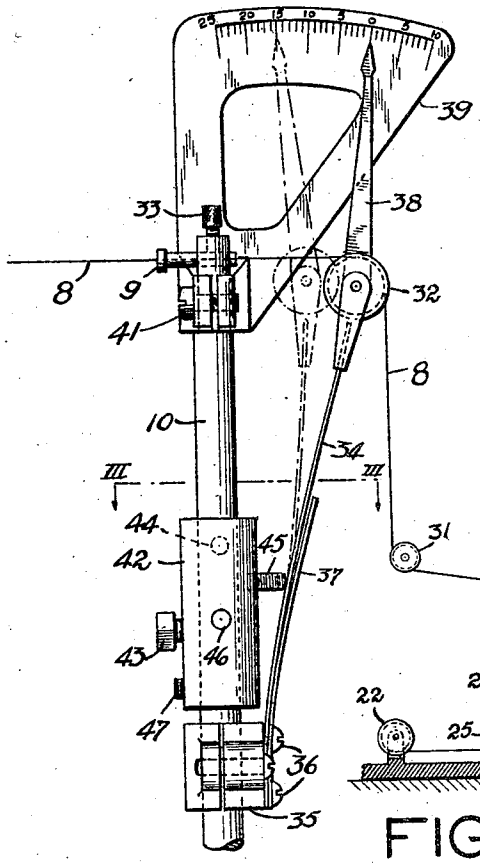


FIG. 2.

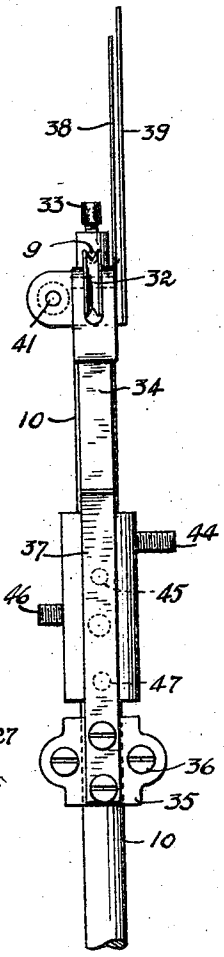


FIG. 3.

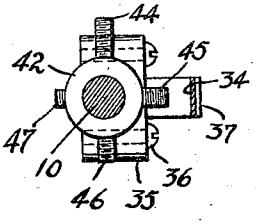
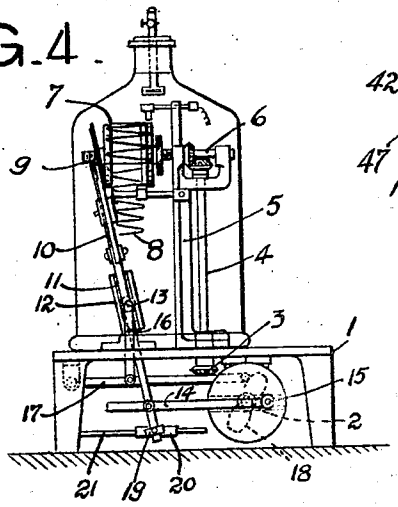


FIG. 4.



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UNITED STATES PATENT OFFICE.

HOMER GEORGE ANDERSON, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO WESTINGHOUSE LAMP COMPANY, A CORPORATION OF PENNSYLVANIA.

MANUFACTURE OF INCANDESCENT LAMPS.

Application filed April 29, 1922. Serial No. 557,371.

This invention relates to the manufacture of incandescent lamps and has special reference to a device for applying and indicating the tension on a lamp filament which is being formed.

An object of my invention is to provide a device for indicating, at all times, the tension on a filament being threaded to a filament-forming machine.

Another object of my invention is to provide an indicator whereby the tension on a filament being fed into a forming machine can be determined, so that a substantially uniform tension may be applied thereto, whereby more desirable results will be secured in the manufacture of filaments which are bent into zigzag form.

A further object of my invention is to provide a device for indicating filament tension in a filament-forming machine and a tensioning device to provide for accurately adjusting such tension so that filaments of different gauge may be formed.

A still further object of my invention is the manufacture of filaments bent into zigzag form, while maintaining uniform the cross-section thereof.

Other objects and advantages of the invention will be apparent as the description proceeds.

In bending filaments preparatory to winding the same upon spiders for incandescent lamps, it has been customary to feed the filament into the machine under a tension more or less indefinite and with no provision for indicating under what tension the filament is formed. It is found that unsatisfactory results, such as non-uniform cross section and short burn-out life of the formed filament, have been due to the non-uniform tension to which the filament has been subjected while being bent into shape and heated in an atmosphere of forming gas.

According to my invention, I propose to form the filament while subjected to a substantially uniform tension, which is adjustable according to the size of and properties desired for the filament and which is indicated preferably by the movement of a pointer over a graduated scale.

It has been found that the homogeneity, amount of stretching, molecular structure and the burn-out life of a filament are dependent on the forming tension, that is, the higher the forming tension, the shorter the life, which depends on the molecular structure. The controlling tension appears to be the maximum tension to which the particular section of filament considered, is subjected while being formed. A filament subjected to a uniform tension according to my invention, may be formed at a higher tension than the average tension on a filament formed under a varying tension as previously used, for the same reduction in burn-out life. By accurately controlling the tension at which a filament is formed, I can therefore control the properties thereof, such as the burn-out life, molecular structure, homogeneity and amount of stretching of the filament.

In the accompanying drawing, showing one embodiment of my invention, Fig. 1 is a front elevation of the tension-indicating attachment and tensioning device for a filament-bending or forming machine;

Fig. 2 is a side view of the device shown in Fig. 1, the filament and tensioning device therefor being omitted for clearness;

Fig. 3 is a section on the line III—III of Fig. 1 looking in the direction of the arrows, the set screw being omitted for clearness; and,

Fig. 4 is a side view of a filament-forming machine illustrating an application of my invention thereto.

My invention may be employed in connection with an apparatus for bending filaments such as is described and claimed in the application of Anton Lederer, Serial Number 879,761, filed December 30, 1914, now Patent #1,419,153, June 13, 1922, and assigned to the Westinghouse Lamp Company, or it may be used on the modification thereof shown in Fig. 4.

In said figure, a frame 1 in the form of a table carries the various parts of the machine. Beneath the top of this frame may be mounted a driving mechanism including a driving shaft 2 connected through gearing 3 to the lower end of a counter shaft 4 mounted in a standard 5 on the top of the frame. The counter shaft 4 may be geared at its upper end to a horizontal shaft 6 suitably journaled on the standard 5 and carry an adjustable drum 7 over which the filament 8 to be formed is wound by the movement of the drum. The filament wire is given a sinuous or zigzag form by being wound back and forth on suitable forming

pins radially fixed to the adjustable drum 7. When wound on the drum, successive sections of the filament are given a permanent set by being heated to incandescence in an atmosphere of forming gas, as is well understood.

The filament 8 is fed to the drum through an eyelet of wire guide 9 on a threading arm 10 which is given an oscillating and reciprocatory motion by any suitable means. A block 11 is connected to the arm 10 and slides in the guide 12 which is journaled about pivot 13 so that it can rock, as much as necessary, as the arm 10 oscillates. The arm 10 may be oscillated by a connecting rod 14 driven from a crank pipe 15 on the shaft 2. The block 11 may be raised and lowered at the proper times, by the driving mechanism, through any suitable means, such as a link 16 connected to the pivot 13 and to a pivoted cam follower 17 which engages a double lobe cam 18 mounted on the driving shaft, as shown.

The cam 18 and the crank pin 15 are set in such an angular relation that, as the wire guide is moved toward one of the pins of the drum by the crank pin 15, the pivot 13 is simultaneously raised so that the wire guide begins to follow a path which curves about the forming pin. As the drive shaft continues to turn, the crank reaches the dead center when the wire guide is outside the row of pins. At this time, the cam 18 is lowering the pivot of the wire guide and the guide sweeps around the outside of the pin. Due to the combined lifting or lowering of the cam 18 and the traversing of the crank pin 15, the wire guide is moved so as to describe a double loop and the motions are so synchronized that one loop is described about a pin at the left and the other about a pin at the right and so on.

To steady the lower end of the arm 10, there may be provided a guide ring 19 mounted on trunnions in a guide block 20 which slides back and forth on guide 21 carried by the frame. The filament wire is drawn from its spool around a suitable adjustable tensioning device such as illustrated in Fig. 1 so that it feeds to the machine at the desired tension.

Referring now particularly to Fig. 1, the filament 8 being fed in the machine, is drawn from a rotatable spool 22, so mounted that an appreciable though small amount of friction is exerted against its rotation. From this spool, the filament passes to a tensioning device which preferably comprises a rotatably mounted cylinder or drum 23, accurately formed and centered, around which the filament may be wound with just enough turns to prevent slipping thereon. The drum 23 is provided with a braking device such as the tension strap brake 24 which frictionally engages the cylindrical spool 25, which is rigidly connected to the drum 23. The brake may be placed under tension by a spring 26, and the tension thereof may be adjusted, according to the size of filament to be bent, by any suitable means, such as the key 27 in the form of a frictionally held tapered plug around which the strap brake 24 is adapted to be wound and unwound. In this way, any desired tension can be accurately applied to the filament being wound.

After passing from drum 23, the filament 8 may pass over idler 28 rotatably mounted on resilient member 29, supported rigidly at its other end, as shown. The resilient member serves to maintain the filament tension uniform by bending if the tension varies. The strap brake 24 is also shown connected to member 29, which connection obviously also serves to stabilize the filament tension for any adjustment of the key 27. The filament 8 then may pass to idler 31 and from there emerge in a substantially vertical direction and pass over a pulley 32 and through eyelet or filament guide 9 held on the end of the threading arm 10, as by means of set screw 33. The filament is fed directly from the eyelet 9 to the forming drum. In order to indicate the tension on the filament, the pulley 32 is held on a spring 34 attached to a collar 35, which may be adjustably clamped on the arm 10 by means of screws 36.

As a means for stiffening the spring 34, a second similar but shorter spring 37, attached to the collar 35, extends alongside of the spring 34, part of the way toward the pulley 32. The spring 34 also carries, preferably at its free end, a pointer 38, which may indicate the filament tension by the reading shown by it on a graduated scale 39, which scale may be suitably held on the free end of the arm 10 by means of clamping screw 41. In order to adjust the spring capacity according to the size of the filament being used, an adjusting bushing 42, adapted to be clamped in different positions, as by means of set screw 43, is provided on the arm 10.

Any suitable means may be provided on this bushing for forming spring supports of different heights and at different locations. As shown in this embodiment, said means comprise four studs 44, 45, 46 and 47 arranged in different positions along the length of the bushing. Said studs are also arranged in different angular positions on said bushing, for example, as shown in Fig. 3, they are arranged at angles of approximately 90° to each other. When it is desired to provide a relatively high tension on the filament wire, the longest stud 44 is positioned so that the spring 34 engages therewith. The key 27 is then turned to apply the desired increased tension to the filament. This longest stud, as is apparent, being farthest from

the collar 35 supporting the spring, reduces the lever arm of the filament passing over the pulley 32 and thereby provides, in effect, a stiffer spring for being stressed by the filament.

When a spring is desired that is less stiff, one of the other studs, for instance stud 45, is used, as shown in Fig. 1, thereby increasing the lever arm of the filament for indicating a weaker tension for the same displacement of the spring. In this way, the range of tensions indicated on the scale may be varied to suit the filament being formed.

The flat leaf spring may be calibrated by detaching the arm 10 from the machine and supporting it in horizontal position. The spring is then loaded by means of a thread or wire passing thereover and placed under tension by means of a spring balance or suitable weights held in a weight pan. The amount of force applied, divided by the movement of the pointer over the graduated scale, indicates the amount of tension represented by the graduations thereof. In Fig. 1, the dot-dash position of the pointer shows a position thereof when the filament is under tension.

By my invention, I have provided means whereby the filament tension may be accurately controlled and measured. The provision of the tensioning device for a separate drum instead of directly for the filament spool, as heretofore, eliminates the former objectionable features of eccentric spools, spools of various diameters and in various stages of being unwound and non-uniform axle-spool spring-grips. These former objectionable features made it impossible to keep the filament under a uniform tension. By eliminating the noted former defects, I can wind the filament on a continuous forming machine under a uniform tension, which may be accurately adjusted to any desired degree by my external tension control and shown by my indicator and thereby produce a homogeneous filament of unvarying cross-section, stretched in the forming machine according to the tension applied thereto, because it is heated in the forming machine while under a uniform tension. The forming of the filament under a uniform tension, makes it possible to form filaments of much smaller cross-sections than heretofore, because breakage due to fluctuations in tension is eliminated.

While I have illustrated what I now consider to be a preferred embodiment of my invention, it is to be understood that many changes may be effected therein and I wish to be limited only by the scope of the appended claims.

What is claimed is:

1. In a filament-bending machine, a filament-threading arm, a scale attached thereto, a resilient plate attached to said arm, said plate carrying means for guiding the filament and a pointer movable along the scale to indicate the tension on the filament.

2. In a filament-bending machine, a filament-threading arm, a graduated scale attached thereto, a resilient plate attached to a collar adjustable on said arm, said plate carrying means for guiding the filament and a pointer movable along the scale to indicate the tension on the filament.

3. A forming machine comprising a filament-threading arm, means for indicating the tension on the filament being formed comprising a graduated scale attached to the filament threading arm, a flat spring carrying a pulley for guiding the filament and a pointer adapted to move over the scale.

4. In a filament-bending machine, an arm holding means for guiding a filament and movable for the purpose of bending the filament, means for indicating the tension on the filament being bent comprising a resilient member, a pulley carried on said member over which the filament passes and a pointer adapted to indicate filament tension.

5. In a filament-forming machine, a filament threading arm, a graduated scale attached thereto, means for indicating filament tension comprising a spring member adjustably held on said arm and holding a pulley over which the filament passes and a pointer attached to said spring and indicating the tension on the filament, by its position with respect to the scale.

6. In a filament-forming machine, an arm for guiding the filament, a graduated scale attached thereto, a collar clamped on said arm and holding a resilient member and a bushing for modifying the effective stiffness of the resilient member comprising a hollow cylindrical member on said arm provided with studs of various lengths adapted to engage the resilient member, said resilient member supporting means for guiding the filament and a pointer moving over the graduated scale.

7. Means for indicating the tension on a filament being wound upon a filament-forming machine comprising a threading arm, a scale and a spring on said arm, said spring carrying a filament guiding pulley and a pointer movable over said scale.

8. Means for indicating the tension on a filament being wound upon a filament-forming machine comprising a threading arm, a scale and a spring on said arm, said spring carrying a filament guiding pulley and a pointer movable over said scale, a bushing adjustably held on said arm and provided with studs projecting various distances from the same and each adapted to engage the spring according to the position of the bushing.

9. Means for indicating the tension on a filament being wound upon a filament-form-

ing machine comprising a threading arm, a graduated scale supported near the free end of said arm, a clamping member adjustably holding a spring on said arm, said spring carrying a filament guiding pulley and a pointer movable over said scale, a bushing adjustably held on said arm and provided with studs projecting various distances from the same and each adapted to be engaged with the spring according to the position of the bushing.

10. A filament-bending machine comprising a forming drum, a cylinder, a filament having a bight thereof applied to said cylinder, frictional braking means for applying uniform resistance to the rotation of the cylinder, a resilient member having a pulley over which the filament passes and means associated with said member for indicating the tension on the filament as the filament passes onto the forming drum.

11. In a filament-bending machine, a spool from which the filament is unwound, an accurately formed and centered drum around which the filament is drawn without slipping, a braking device on the drum, adjustable so that any desired tension may be applied to the filament, a resilient member holding an idler over which the filament passes in such a way that bending occurs if the filament tension varies and means for indicating the tension on the filament as it is about to be bent.

In testimony whereof, I have hereunto subscribed my name this 28th day of April, 1922.

HOMER GEORGE ANDERSON.