K. SCHRÖTER.

SHAPING AND MOUNTING FILAMENTS.

APPLICATION FILED JAN. 4, 1911.

1,013,958.

Patented Jan. 9, 1912.

Fig. 1.

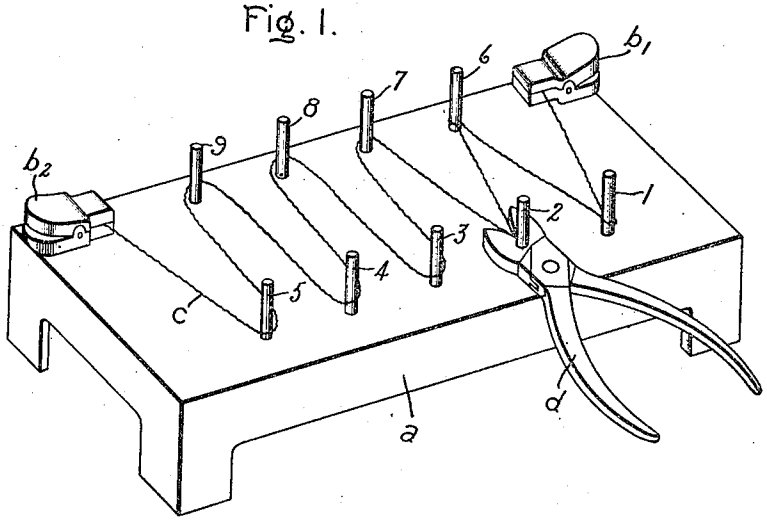


Fig. 2.

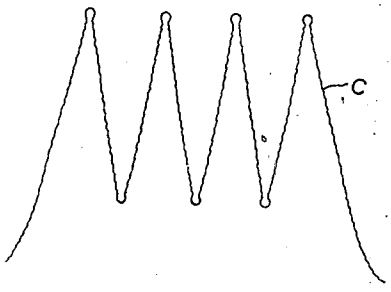
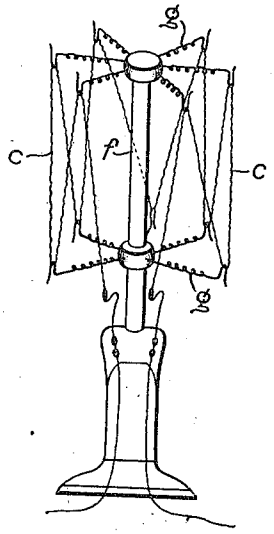


Fig. 3.



Witnesses:

Benjamin B. Hull

Helen Oxford

Inventor:

Karl Schröter,

by Albert G. Davis

His Attorney.

UNITED STATES PATENT OFFICE.

KARL SCHRÖTER, OF BERLIN, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

SHAPING AND MOUNTING FILAMENTS.

1,013,958. Specification of Letters Patent. Patented Jan. 9, 1912.

Application filed January 4, 1911. Serial No. 600,732.

To all whom it may concern:

Be it known that I, KARL SCHRÖTER, a subject of the Emperor of Germany, residing at Berlin, Germany, have invented certain new and useful Improvements in Shaping and Mounting Filaments, of which the following is a specification.

My invention relates to the shaping and mounting of filaments, and its object is to facilitate these operations and to make it possible to carry them out with better and more uniform results. Various other advantages which may be realized by its employment will hereinafter appear.

In describing my invention, I have referred to the apparatus in connection with which it is employed as an incandescent electric lamp.

The invention is very useful in connection with lamp filaments—such as tungsten and tantalum filaments—which at their operating temperatures become so soft as to require efficient support additional to that afforded by their current supply conductors; and it is especially desirable for ductile filaments of this character.

When a great length of filament is employed, it has been found desirable to arrange it in the lamp in a continuous piece having a more or less complex form, the filament being given such form as an incident of the operation of placing it on its supporting means. This operation may be carried out either when the filament is in its finished condition and has its final composition or at some stage of its manufacture in which it is in a condition in which it can readily be manipulated, according to convenience and the final properties of the filament, etc. Thus incandescent bodies for metallic filament lamps consisting of ductile materials may be made by rolling, drawing, etc., the materials into wires of suitable diameter; and the wires may then be placed upon the supporting means of the lamp in one continuous piece supported at suitable points. Filament material that is not sufficiently ductile may first be incorporated into a composition that can be readily worked mechanically by mixture or composition with suitable "auxiliary metal," and such composition may then be given the form of wire by rolling or drawing. Such wire may be placed upon the filament supporting means of the lamp in a continuous piece and after it is in place the auxiliary metal may be removed from it by heating with electric current.

In the methods mentioned above, the incandescent body is placed upon the supporting means at the same time that it is given its form, the commonest forms being sinuous and zigzag forms, or similar forms produced by carrying the wire back and forth. The concurrence of the operations of shaping and mounting gives rise to disadvantages which will be hereinafter indicated.

In accordance with my present invention, the wire or filament is given its form and put in place as two different steps. The filament may be given its serpentine or other form on a special apparatus, the formed filament being thereafter placed upon the filament engaging members or supporting hooks of the final supporting system in such a manner that the curved portions or bends of the filament rest upon these members. The special frame or shaping device used for the shaping of the filament may be of greater mechanical strength than the final filament supporting means, so that the forces required to overcome the elastic properties or resistance of the filament material in shaping the filament will be sustained by it without injury.

In Figure 1 is shown diagrammatically (by way of example) a shaper adapted for the present process; in Fig. 2 is shown a shaped filament after removal from this shaper; and in Fig. 3 is shown a filament mount which illustrates some of the advantages obtainable by the employment of my invention.

Upon a base-plate *a* are arranged two rows of pins 1 to 9 and two clamps b_1 and b_2. Starting from one holding clamp, the wire or filament *c* (in some instances wavy) is carried back and forth in a serpentine form around the pins 1 to 9, with or without tension, and its other end is secured in the second clamp. Then the curved portions extending around the pins 1 to 9 are given a bend by pliers or pincers or some other suitable tool, as by pressing hard ("straff") against the forming pins, so that in consequence of the elastic limit of the filament material being exceeded a permanent change of form is produced at these places, and the filament preserves the form indicated in Fig. 2 after its removal from the shaper. The pins of the shaper may be heated,—as, also,

may be the tool. The form of the filament directly after being placed upon this shaper—that is, before the actual forming operation—is represented in Fig. 1 at pins 3, 4, 5, 7, 8, 9, while the form of the filament at pins 1 and 6 shows the result of the permanent forming operation. At pin 2 is shown a pair of pliers *d* adapted for the forming operation as described above, and having suitably shaped inner faces.

Having been brought into its final form (Fig. 2), the filament is placed upon the final filament-supporting system (as, for example, that shown in Fig. 3). The filament-supporting system shown in Fig. 3 has very thin, elastic filament-holders, and in connection with it the present process is particularly advantageous. The stretching required in forming the filament on the final supporting means would not be permissible with these holders, whereas in the process described the application of the previously formed filament to such delicate elastic frames offers no difficulties. The filament-holders *g* (Fig. 3) are shown as spiral springs, but may be of any other desired form and are supported by the pedestal *f*.

The shaping and mounting of the filament as successive operations according to the present process presents advantages over simultaneous shaping and mounting (whether mounting be effected during the course of manufacture by the aid of auxiliary metal or other binding material, for example, or after manufacture) additional to that of avoiding subjection of the final supporting means to stress in the shaping of the filament. When simultaneous mounting and shaping of the filament is done by unskilled persons or with rapidity, the various lengths or sections into which the filament is divided by the members engaging it are not sufficiently regular in length, some of them being too slack and others too taut, so that it is found necessary to bend and manipulate these members after the filament has been placed on them to bring the several sections to a proper and regular degree of tautness or slackness and to bring the parts of the mount as a whole into proper relation to one another and to correct any deformation which they may have suffered in the mounting and shaping of the filament. For similar reasons it may also be necessary to shift the filament on the supports and change its points of curvature. This work is tedious, requires a considerable amount of time and care, gives rise to more or less breakage, and as a whole results in a material increase in the cost of the lamp. By the employment of my invention, it is possible to make the various filament sections of very nearly regular and proper length at the outset, with the result of decreasing the work of the character just referred to that is necessary and the consequent breakage, making the spacing of the filament sections and their tautness or slackness more regular, giving the lamp a more uniform and pleasing appearance, reducing short circuits due to excessive vibration of very slack filament sections, and eliminating filament breakage caused by shrinkage of excessively taut sections,—the latter especially when binder is removed from the filament after mounting. When the filament engaging members are resilient, the slight temporary displacement allowed by their resilience may allow the application of the accurately-shaped filament to them without any of the manipulation above referred to.

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

1. The method of shaping and mounting a filament of complex form consisting of bends and intervening portions supported by means engaging at its successive bends, which consists in giving to the filament a definite bent form conformable to its arrangement on its supporting means and placing it upon the supporting means as distinct operations.

2. The method of shaping and mounting long incandescent lamp filaments bent back and forth and supported at the bends which consists in giving to a ductile metallic filamentary body a bent form conformable to its arrangement in the lamp and afterward placing it upon its final supporting system in such manner that the bends previously formed rest on the filament-engaging members of said system.

3. The method for the manufacture of filament mounts comprising long filaments carried back and forth on supporting frames which consists in giving the filamentary body a sinuous form on a suitable shaper and afterward placing the shaped filamentary body upon the supporting frame in such manner that its bent portions rest on the filament-engaging members of said frame.

In witness whereof, I have hereunto set my hand this 21st day of December, 1910.

KARL SCHRÖTER.

Witnesses:
WOLDEMAR HAUPT,
HENRY HASPER.