

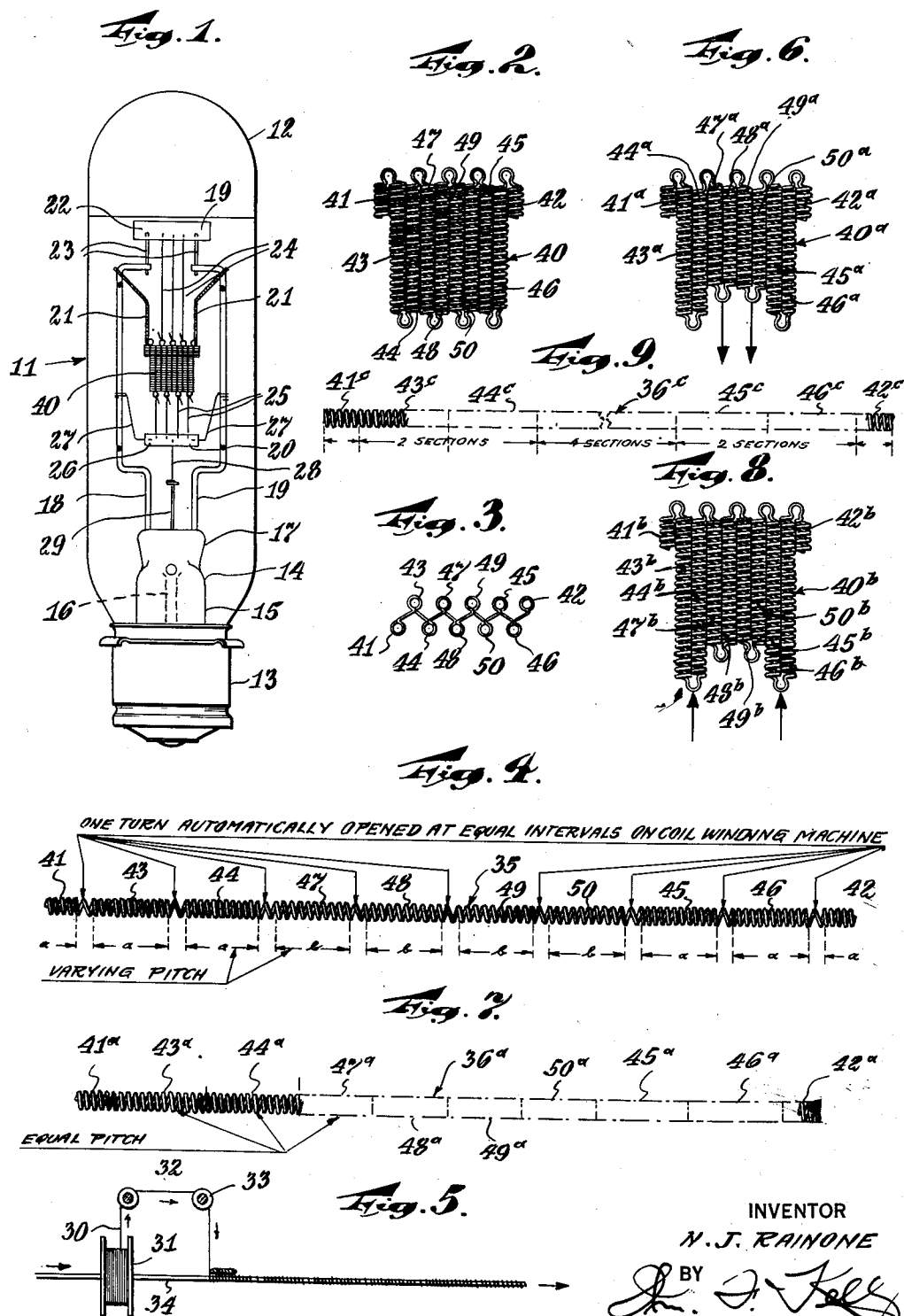
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LAMP, FILAMENT THEREFOR AND METHOD

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LAMP, FILAMENT THEREFOR AND METHOD

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This invention relates to lamps and, more particularly, to filaments for projection lamps.

The conventional filament for an incandescent electric lamp, such as a projection lamp, is a biplane ten-section filamentary translation device having the first and last sections for mounting, the second and third and eighth and ninth sections as outer sections, and the remaining four sections as inner or center sections.

Before the development of coil bending machines as disclosed in U. S. Patent No. 2,449,653, issued September 21, 1948, such sectional filaments were differentially wound on a coil winding machine with three to five mm. spaces or open turns between sections. The filaments were hand formed by bending this open turn between sections over a hot knife. By this method it was possible, through the use of the proper cam arrangement on the coil winding machines, to wind the outer sections with a closer pitch than the center sections of the filament.

However, because of the relatively large space between sections on such a differentially wound filament, it is not possible at present to bend the sections on the new coil bending or forming machine. A continuously wound coil having an overall length undesirably longer than the differential coil is used. The machine-forming method is extremely desirable in the production of filaments, as the rate is three times that of the hand forming method.

In projection lamp operation, the center or inner sections of the filament are mutually heated by one another and by the adjacent outer sections. Also, the outer sections are cooled to a greater extent than the inner sections by conduction through and convection currents in the gas in the enclosing bulb or envelope. Hence, the center sections tend to operate at a higher temperature than the outer sections, thereby giving both non-uniform filament temperature and resultant screen illumination. In addition, such center sections tend to develop hot spots which shorten the life of the lamps. Further, a non-uniform light source is difficult to focus and decreases the screen intensity.

This defect was formerly compensated for and reasonably corrected by the differentially wound filament having a smaller pitch and consequently more turns in the outer sections having the same length as the center sections of the filament. However, with the new coil forming or bending machines, the differentially wound sectional filament has not been usable.

Hence, it has been found advantageous, ac-

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cording to my invention, to employ the following methods of filament manufacture which permit use of the desirable machine-forming method and give a more uniformly heated filamentary light source which will increase screen intensity and uniformity, facilitate focusing, and give a longer lamp life:

1. The method of sectional filament manufacture comprising machine winding a differential coil having a smaller pitch in the outer sections than in the inner sections and only small breaks between sections, and machine forming the coil into a biplane sectional filament.

2. The method of continuous filament manufacture comprising machine winding a continuous coil having a pitch which is desired in the later formed outer sections, machine bending the coil into a biplane filament having more turns in the outer sections than in the center sections, and stretching while hot the center sections to the same length as the outer sections.

3. The method of continuous filament manufacture comprising machine winding a continuous coil having a pitch which is desired in the later formed center sections, machine bending the coil into a biplane filament having more turns in the outer sections than the center sections, and compressing while hot the outer sections to the same length as the center sections.

4. The method of continuous filament manufacture comprising machine winding a continuous coil at a pitch which is desired in the later formed outer sections, selecting from each end of the coil a sufficient number of turns to comprise the respective outer sections, stretching while hot the middle of the coil to give the desired larger pitch in the center sections, and machine-forming the coil into a biplane sectional filament.

In its general aspect, the present invention has the object of producing a biplane sectional filament as a uniformly heated light source for a projection lamp which will increase screen intensity and uniformity, facilitate focusing, and give a longer lamp life.

Specifically, an object of the present invention is a method of filament manufacture which permits use of the desirable machine-forming method.

Another specific object is the method of sectional filament manufacture comprising machine winding a differential coil having a smaller pitch in the outer sections than in the inner sections and only a small break between sections, and machine forming the coil into a biplane sectional filament.

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An additional object is the method of continuous filament manufacture comprising machine winding a continuous coil having a pitch which is desired in the later formed outer sections, machine bending the coil into a biplane filament having more turns in the outer sections than in the center sections, and stretching the inner or center sections to the same length as the outer sections.

Another object is the method of continuous filament manufacture comprising machine winding a continuous coil having a pitch which is desired in the later formed center sections, machine bending the coil into a biplane filament having more turns in the outer sections than the center sections, and compressing under heat the outer sections to the same length as the center sections.

A further object is the method of continuous filament manufacture comprising machine winding a continuous coil at a pitch which is desired in the later formed outer sections, selecting from each end of the coil a sufficient number of turns to comprise the respective outer sections, stretching while hot the middle of the coil to give the desired larger pitch in the center sections, and machine forming the coil into a bi-plane filament.

Other objects and advantages of the invention will appear to those skilled in the art to which it appertains as the description proceeds, both by direct recitation and by implication from the context.

Referring to the accompanying drawing, in which like numerals of reference refer to similar parts throughout:

Fig. 1 is an elevational view of a projection lamp embodying my invention;

Fig. 2 is an elevational view of a biplane sectional filament for the projection lamp of Fig. 1;

Fig. 3 is a top view of the filament of Fig. 2;

Fig. 4 is an elevational view of a differentially wound sectional coil, prior to machine bending;

Fig. 5 is an elevational view of a portion of the coil-winding machine;

Fig. 6 is an elevational view of a filament for the projection lamp of Fig. 1, after machine bending but prior to stretching;

Fig. 7 is an elevational view of a continuously wound coil for the filament of Fig. 6;

Fig. 8 is an elevational view of a filament of the projection lamp of Fig. 1, after machine bending but prior to compressing while hot;

Fig. 9 is an elevational view of a continuously wound coil after stretching the middle of said coil.

Referring to the drawings in detail, there is shown a projection lamp 11 designated for base-down operation and comprising a vitreous envelope 12 with its upper closed end painted black for a light shield and a base 13, and enclosing a mount 14.

The mount 14 comprises a stem 15 sealed to the envelope 12 and provided with an exhaust tube 16 opening through a press 17, leading-in and supporting conductors 18 and 19 extending through the press from the base 13; a top bridge 19, a floating bridge 20; two filament leg inserts 21 and a filament 40.

The supporting conductors 18 and 19, suitably five-piece leads, have their normally upper ends bent to a U-shaped configuration with the elongated bottom section of the U suitably parallel to the axis of the lamp as illustrated in Fig. 1. The upper or free ends of conductors 18 and 19

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are suitably nickel to facilitate the connection of the top bridge 19 thereto.

This bridge 19 consists of a short vitreous cane insulator 22 having two outer support wires 23, suitably nickel, for affixing said bridge to the upper ends of conductors 18 and 19 and three to filament supports 24, suitably molybdenum. Wires 23 and supports 24 have their upper ends embedded in insulator 22 and are insulated thereby from each other. The lower ends of supports 24 are hooked, as illustrated in Fig. 1, to provide top support for the coiled filament 40. The number of supports 24 is determined by the number of coiled sections in filament 40.

In the present embodiment, this filament 40 comprises 10 coiled sections which are connected by inter-section uncoiled loops and staggered so that five are disposed in one normally vertical plane parallel to that of the conductors 18 and 19 and five in a normally vertical plane parallel thereto. The sections are so spaced that in plan, as shown in Fig. 3, they lie at the vertices of isosceles triangles.

In this showing the numerals 41 and 42 respectively designate the first and tenth sections of filament 40, as the fragmentary terminal sections; the numerals 43, 44, 45 and 46 respectively designate the second, third, eighth and ninth sections, that is, the outer sections; and the numerals 47, 48, 49 and 50 respectively designate the fourth, fifth, sixth and seventh sections, that is, the inner sections.

The upper inter-section uncoiled loops of the filament 40 are draped over the hooked ends of top filament support wires 24 and the terminal portions 40 and 41 are respectively electrically connected to conductors 18 and 19 by means of the filament leg inserts 21.

The filament leg inserts 21 each consists of an obliquely L-shaped lead wire, suitably nickel, around which has been wound an appropriate coil having the same pitch as terminal sections 41 and 42 of filament 40. The lower end of each insert 21 is screwed into the respective terminal section of the filament 40. The free or upper end of each insert 21 is secured, as by welding, to the upper or free end of supporting conductors 18 and 19.

In order to position filament 40 between conductors 18 and 19 and allow for expansion and contraction, a floating bridge 20 is provided.

The lower uncoiled portions of the connected sections of filament 40 are secured by hooks in the upper end of the lower filament supports 25 of said bridge 20. In this showing there are four lower supports 25. This bridge 20 comprises a vitreous cane insulator 26 into which the lower ends of supports 25 are embedded and insulated from each other, two floating bridge side guides 27 and a floating bridge bottom guide 28. The side guides 27, suitably thin metallic wires, have their inner ends embedded in the ends of the insulator 26 and their upper ends looped about leading-in conductors 18 and 19 with freedom to slide thereon. The bottom guide 28, similar to guides 27, has its upper end embedded suitably in the underside of insulator 26 and its lower end projecting through the top loop of spud 29 which extends upwardly from press 17 in which its lower end is embedded. After insertion through the loop of spud 29, the end of bottom guide 28 is bent over to prevent disengagement.

After a suitable exhaust, which may consist of a bake, flush with inert gas such as nitrogen, and a final fill of a gas, such as nitrogen at the

conventional pressure, the lamp is tipped off and the base 13 is applied.

According to my invention, the filament 40 may be manufactured by first machine-winding a differential sectional coil 35, as shown in Fig. 4, having a smaller pitch in the terminal sections 41 and 42 and outer sections 43, 44, 45, 46 than in the inner sections 47, 48, 49 and 50 and only a small break or one open turn, such as 0.3 to 0.5 mm., between sections. This may be accomplished by a suitable cam arrangement (not shown) on the coil-winding machine by feeding the filament wire 30 from a reel 31, as shown in Fig. 5, over rollers 32 and 33, and winding said wire 30 on a filament mandrel 34.

The differential sectional coil 35 is then machine-formed on the bending machine by the method and filament-forming apparatus disclosed in U. S. Patent No. 2,449,653, issued September 21, 1948, so that five sections, namely terminal section 41, outer sections 44 and 45 and center sections 48 and 50 are in a normally vertical plane parallel to a second normally vertical plane in which the other five sections lie. The sections are so spaced that in plan, as shown in Fig. 3, they lie at the vertices of isosceles triangles. While a ten section differential coil is shown as a specific embodiment of the present invention, it will be understood that my method may be used in making a filament of any desired number of sections.

An alternative method for manufacturing a filament comprises machine winding, as shown in Fig. 5, a continuous coil 36^a, as shown in Fig. 7, having a pitch which is desired in the later formed four outer sections, namely 43^a, 44^a, 45^a, and 46^a. Coil 36^a is machine bent into filament 40^a, as shown in Fig. 6, having more turns in said outer sections than in the center sections, namely 47^a, 48^a, 49^a, and 50^a. The four inner or center sections are then stretched downwardly while hot to the same length as the outer sections, thereby forming a filament equivalent to that designated 40.

A further alternative method of manufacture of a filament comprises machine winding a continuous coil 36^b, similar to the coil shown in Fig. 7, except having the pitch of the later formed four center sections, namely 47^b, 48^b, 49^b and 50^b. Coil 36^b is then machine bent into filament 40^b, as shown in Fig. 8, having more turns in the outer sections, namely 43^b, 44^b, 45^b and 46^b than in said center sections. The outer sections are compressed under heat to the same length as the center sections, thereby forming a filament equivalent to that designated 40.

A still further method of producing a filament comprises machine winding a continuous coil 36^c having the pitch of the later-formed outer sections, namely 43^c, 44^c, 45^c and 46^c (not shown). From each end of the coil 36^c, the required number of turns is selected to form the two outer sections 43^c and 44^c and 45^c and 46^c on each end, and terminal sections 41^c and 42^c. The middle of coil 36^c is then stretched while hot to give the desired center sections pitch. Coil 36^c, as shown in Fig. 9, is machine formed into filament equivalent to that designated 40, as shown in Fig. 2.

While preferred embodiments of my invention have been disclosed, it will be understood that modifications may be made within the spirit and scope of the appended claims.

I claim:

1. A filament for an incandescent electric lamp having a plurality of coiled sections comprising terminal sections, outer sections and center sections united by looped portions, said outer sections having the same pitch as said center sections and a different length than said center sections whereby said filament may be distorted so as to make said center and outer sections corresponding in length and simultaneously the pitch of the center sections different from that of said outer sections.

2. A filament for an incandescent electric lamp having a plurality of coiled sections comprising terminal sections, outer sections and center sections united by looped portions, said sections so spaced that half of the sections are in a normally vertical plane parallel to the remaining sections in a normally vertical plane and that in plan said sections lie at the vertices of isosceles triangles, said outer sections having the same pitch as said center sections and a different length than said center sections whereby said filament may be distorted so as to make said center and outer sections corresponding in length and simultaneously the pitch of said center sections different from that of said outer sections.

3. A filament for an incandescent electric lamp having a plurality of coiled sections comprising terminal sections, outer sections and center sections united by looped portions, said outer sections having the same pitch as said center sections and a longer length than said center sections whereby said center sections may be stretched to corresponding length so as to simultaneously make the pitch of the center sections larger than that of the outer sections.

4. A filament of an incandescent electric lamp having a plurality of coiled sections comprising terminal sections, outer sections and center sections united by looped portions, said outer sections having the same pitch as said center sections and a longer length than said center sections whereby said outer sections may be compressed to corresponding length so as to simultaneously make the pitch of the outer sections smaller than that of the center sections.

5. A filament for an incandescent electric lamp having a plurality of coiled sections comprising terminal sections, outer sections and center sections joined together at their ends, said outer sections having the same pitch as said center sections and a different length than said center sections whereby said filament may be distorted so as to make said center and outer sections correspond in length and simultaneously the pitch of the center sections different from that of said outer sections.

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