May 29, 1928. 1,671,805

P. R. BASSETT

PROJECTOR LAMP

Filed Nov. 25, 1922

Fig. 1.

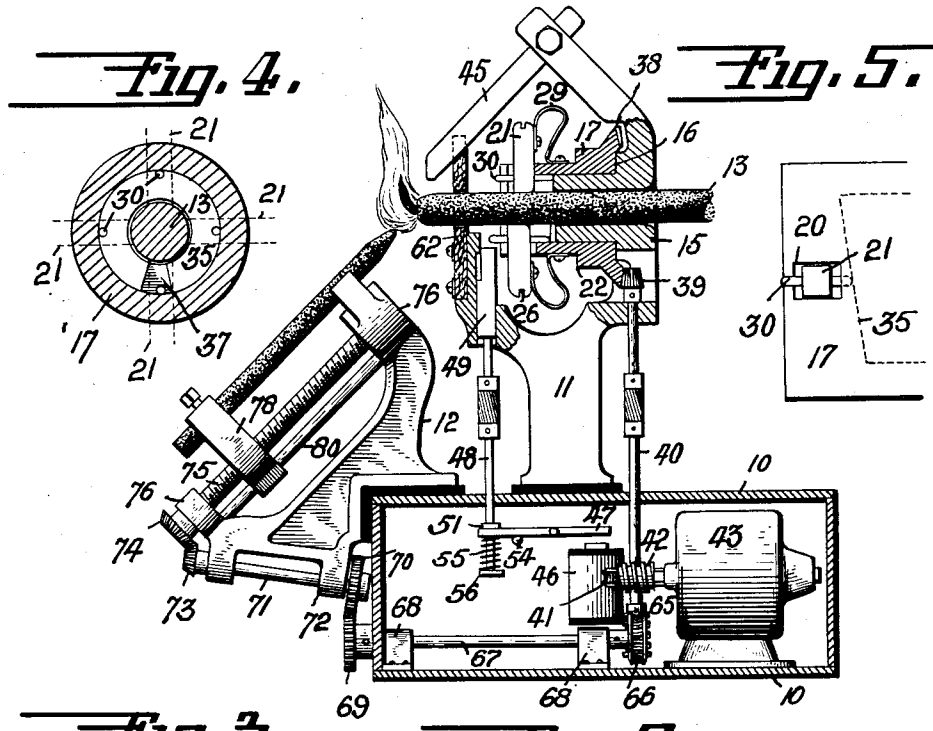


Fig. 4.

Fig. 5.

Fig. 3.

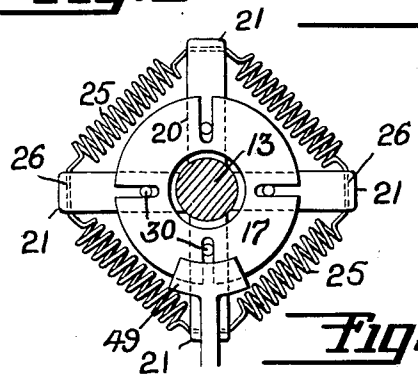


Fig. 2.

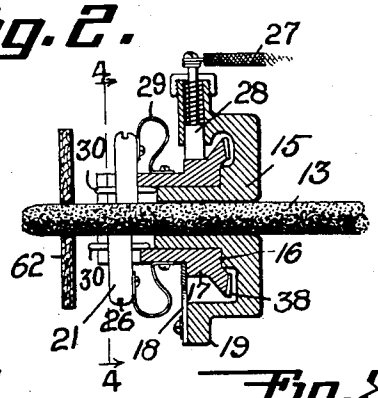


Fig. 6.

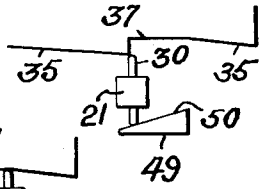


Fig. 8.

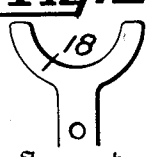


Fig. 9.

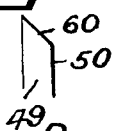
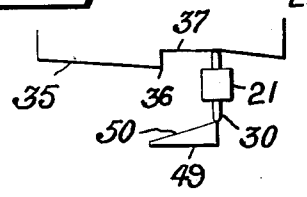


Fig. 7.



Inventor

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By his Attorney

Herbert H. Thompson

Patented May 29, 1928. 1,671,805

UNITED STATES PATENT OFFICE.

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PROJECTOR LAMP.

Application filed November 25, 1922. Serial No. 603,288.

This invention relates to feeding means for the electrodes of projector lamps, especially of the high intensity type. It is the principal object of this invention to provide a lamp wherein the means for automatically operating the electrodes is highly reliable and accurate in its action, but is nevertheless simple in construction, of few parts, and light in weight.

As at present constructed, the positive electrode (at least) of these lamps is rotated as well as fed, and separate means are used to rotate, feed and introduce current to the electrode. This not only results in complications, but prevents the using of the last four to six inches of each electrode by reason of the fact that the electrode gripping means is necessarily located behind the brushes for introducing current into the electrode. By my invention, I overcome this difficulty by a novel construction of brushes, whereby the brushes themselves not only introduce current into the electrode, but also feed the same and rotate it, if desired.

The feeding means is adapted to be used in connection with any control system whether governed by the voltage of the arc, the length of the arc or the position of the carbon tips. The feeding means may be applied to either the positive or negative electrode, or to both.

A further object of the invention is the provision of means for feeding one of the electrodes at a constant rate, while the other electrode is maintained in a given position.

In the accompanying drawings wherein I have shown what I now consider to be the preferred form of my invention,

Fig. 1 is a front view, vertically sectioned, of a projection lamp in which the positive electrode feeding mechanism embodies my invention.

Fig. 2 is a detail of the electrode feeding mechanism embodying my invention, the view being a plan of the mechanism as shown in Fig. 1.

Fig. 3 is an end elevation of the positive electrode feeding mechanism of Fig. 1, showing the brush-returning member in inoperative position.

Fig. 4 is a section taken on the line 4—4 of Fig. 2.

Fig. 5 is a diagrammatic view showing in plan one of the feeding-brushes in the rotary brush holder.

Fig. 6 is a diagrammatic representation showing a brush of the positive electrode feeding mechanism about to be returned to starting position by the rotating member.

Fig. 7 is a view similar to Fig. 6, but showing the brush returned to starting position.

Fig. 8 is a detail of a holding bracket.

Fig. 9 is a view of the upper end of a modified form of brush-returning member.

Referring to the drawings, the lamp mechanism comprises a casing 10 in which is positioned various operating mechanism to be described hereinafter, and upon which are mounted supporting brackets 11 and 12, insulated from said casing, for holding the positive and negative electrodes, respectively. The bracket 11 is formed with a fixed hub 15 bored centrally to permit an electrode 13 to slide therethrough. Rotatably mounted on the outside of the hub and bearing against a shoulder 16 thereof is a collar or brush-holder 17. The collar is held against said shoulder 16 and prevented from slipping off the hub by a bifurcated holder 18 fixed to the bracket at 19 and operating against a circumferential shoulder 22 formed on the outside of the brush-holder. Said brush-holder is provided near the forward end thereof with a plurality of slots 20 preferably symmetrically disposed and in each of which operates a brush or gripping member 21. In the device illustrated, four slots are provided in which operate four brushes. The slots are formed to permit movement of said brushes axially of the collar. The brushes are normally pressed into resilient engagement with the electrode by means of a spring 25 (see Fig. 3) passing around the brushes and lodging in grooves 26 (see Fig. 1) in the outer ends thereof. For the sake of clearness, the spring 25 has been removed in Fig. 1. Current is supplied to the electrode by means of a main lead 27 supplying cur-

rent to a brush 28 slidable on the outer surface of collar 17, and from said collar to the brushes 21 by flexible conductor-strips 29.

For feeding the electrode (here shown as the positive electrode) each brush 21 is provided with a pin 30 fixedly secured thereto and extending therethrough parallel to the axis of the sleeve and the electrode. The pins extend within the bore of the sleeve and when the brushes 21 are at the outer (right, in the drawings) end of slots 20, one end of each of said pins contacts with the inner (left) face of hub 15. Said face is in the form of a cam 35 extending through a full 360° and then dropping abruptly to the starting point (see Figs. 6 and 7). It is obvious therefore, that if the collar 17 is rotated, the pins will ride along the face of the cam and will be forced inwardly (to the left) together with the brushes to which they are fixed. The brushes being in resilient, gripping engagement with the electrode, the latter will be fed inwardly. For rotating the collar 17, the latter may be provided at its outer edge with a bevel gear 38 which meshes with a pinion 39 at the upper end of a rod having a worm 41 near its other end meshing with a worm gear 42 on the shaft of a motor 43.

From the above description it will be apparent that once the pins 30 have ridden successively to the steepest point 36 of the cam (see Figs. 6 and 7) and brushes 21 have reached the inner (left) end of the slots 20, they will remain in this position and no further feeding of the electrode will take place until the pins are moved outwardly into engagement with the low point 37 of the cam 35. It is essential also that feeding shall take place only when the electrode has burned away sufficiently to necessitate such feeding. For this purpose, means are provided for returning the pins and their brushes to low portion 37 of the cam, in rotation and preferably one at a time, so that while the remaining brushes (in this case, three) hold the electrode against outward movement, a less number of brushes (in this case one) may be moved outwardly into contact with part 37 of the cam. Means are provided further, for rendering the brush-returning means effective only when feeding of the electrode is required.

The feeding of the electrode 13 may be controlled by a third electrode 45, as shown, or by any other controlling device such as a thermostat, designed to close a circuit, when the carbon has burned away sufficiently, through an electro-magnet 46 with which cooperates one end of an armature 47. When the electromagnet attracts said armature, the other end thereof engages a flange 51 on rod 48 carrying a member 49 at its upper end to move said member into the path of pins 30. Member 49 is provided with an inclined cam surface 50 positioned so that a pin 30 strikes said surface just as said pin reaches the highest point of the cam 35. A slight further movement of the pin causes it to drop off cam 35, and still further movement along the surface 50 causes said pin to be moved in counter-feeding direction into engagement with the low portion 37 of said cam, and hence moves the brushes 21 to the outer ends of slots 20. Although the return movement of the brushes is in a direction opposite to that of feeding, the electrode is not drawn outwardly to lengthen the arc because the other three brushes are either stationary or moving the electrode inwardly in feeding direction, that is, as long as less than half the total number of brushes are being returned, there will be more brushes holding the electrode against return movement and the electrode will not be fed backwards. It is thus apparent that as long as electromagnet 46 is energized, i. e., as long as there is necessity for feeding the electrode 13 inwardly, member 49 will be effective to return the brushes one after the other in succession to the low point of cam 35, where by the continuous rotation of brush-holder 17, the brushes will again move inwardly to continue feeding said electrode. When the proper feeding position is reached, the circuit through electromagnet 46 is broken, member 49 is moved to inoperative positon, and as soon as all of the brushes 21 have been moved to the inward extremities of slots 20, no further feeding will take place. Should the member 49 be rendered effective at a time when it is directly underneath a pin 30, the upward movement of said member is prevented by said pin until the latter has passed beyond member 49. Contact between the electromagnet and its armature during this period will not be effected, a condition which is rendered possible by the weakness of said magnet. A stop 54 fixed to the casing 10 beneath one arm of said armature limits the movement of the latter in ineffective position, and to relieve the magnet of a heavy load, a spring 55 may be interposed between the end of the armature supporting rod 48 and a stop 56 fixed to casing 10 to provide the necessary degree of counterbalance. If desired, the upper end of member 49 may, in addition to the cam-face 50 inclined laterally, be beveled as at 60 (Fig. 9) to provide an incline longitudinally, so that if member 49 in rising encounters a pin 30, it will move said pin outwardly instead of being held beneath the pin until the latter passes beyond said member.

An asbestos shield 62 may be fixed to bracket 11 at the inner end thereof to shield the electrode feeding mechanism from the effects of the arc, openings being provided through which the positive electrode 13 and the control, or third electrode 45, extend.

The negative electrode may be fed at a constant rate directly from the motor 43. For this purpose, shaft 40 may be provided at its lower end with a worm 65 meshing with a worm 66 on the end of a shaft 67 journaled in brackets 68 fixed to casing 10, said shaft 67 extending through the casing. At the outer end of shaft 67 is fixed a gear 69 meshing with a gear 70 at one end of a shaft 71 journaled in brackets 72 forming part of bracket 12. A bevel gear 73 at the other end of shaft 71 meshes with a bevel gear 74 at one end of a screw-threaded shaft 75 journaled in brackets 76 forming part of bracket 12. A carriage 78 is mounted on shaft 75 and on guide-rod 80 for movement parallel to said axis when said shaft 75 is rotated. The negative electrode is held at its rear or outer end in said carriage, its forward end being supported by bracket 76. The constant rotation of motor 43 thus continuously feeds the negative electrode, the rate of feed depending upon the speed of the motor and the various gear ratios in the driving connections between the motor and the carriage 78. The positive electrode is thus held at a given point and is fed to this point whenever it has burned away a predetermined amount, while the negative electrode is fed inwardly continuously at a constant rate.

It will be understood that the feed mechanism described in connection with the positive electrode may be employed for feeding the negative electrode, or both electrodes, if desired. Also, other types of driving means may be employed between the motor 43 and the negative electrode, and in place of cam 35, any other suitable eccentric surface may be employed.

It will thus be apparent that the electrode is rotated, fed and supplied with current by employing a single set of brushes. The brushes are positioned adjacent the arc, and, as no other mechanism comes into contact with the electrode, the latter can burn away until only a very short stub is left, thus reducing the portion of the electrode which is wasted.

In accordance with the provisions of the patent statutes, I have herein described the principle of operation of my invention, together with the apparatus, which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means. Also, while it is designed to use the various features and elements in the combination and relations described, some of these may be altered and others omitted, without interfering with the more general results outlined and the invention extends to such use.

Having herein described my invention what I claim and desire to secure by Letters Patent is:

1. In a projector lamp, an electrode, gripping means in continuous engagement with said electrode, a cam engageable by said gripping means, said cam and said means being so movable relatively that said means is moved in feeding direction.

2. In a projector lamp, an electrode, gripping means in continuous engagement with said electrode, a cam engageable by said gripping means, said cam being disposed in a plane substantially perpendicular to the axis of said electrode, said cam and said means being so rotatable relatively that said means and said electrode are moved in feeding direction.

3. In a projector lamp, an electrode, a cam, means continuously secured to said electrode and engaging said cam, said electrode being so rotatable relative to said cam that said means and said electrode are moved in feeding direction.

4. In a projector lamp, an electrode, gripping means in continuous engagement with said electrode, a cam engageable by said gripping means, said cam being disposed in a plane substantially perpendicular to the axis of said electrode, said electrode being so rotatable relative to said cam that said means and said electrode are moved in feeding direction.

5. In a projector lamp, an electrode, a feeding member, said electrode and member being relatively rotatable, means continuously secured to said electrode and engaging said member to move said electrode in feeding direction during relative rotation of said electrode and member.

6. In a projector lamp, an electrode, gripping means in continuous engagement with said electrode to rotate and feed the same, a feeding member engageable by said gripping means, said member and said electrode being relatively rotatable, said feeding member being adapted to move said gripping means in feeding direction during relative movement of said member and electrode.

7. In a projector lamp, an electrode, a plurality of gripping members engaging said electrode, means for moving said gripping members in feeding direction and means rendered effective by burning away of the electrode to a predetermined degree for returning said members in rotation to the starting position.

8. In a projector lamp, an electrode, a plurality of gripping members resiliently engaging said electrode, a feeding member for moving said gripping members in feeding direction a predetermined distance, and means rendered effective by burning away of the electrode to a predetermined degree for returning less than one half of said members at a time to the starting position.

9. In a projector lamp, an electrode, a plurality of gripping members engaging said electrode, means for reciprocating said members in feeding direction and in counter-feeding direction, said means comprising a cam engageable by said gripping members for moving a plurality of said members simultaneously in feeding direction, a cam to engage and return said gripping members one at a time in the opposite direction, and means whereby said cam is rendered effective by burning away of the electrode to a predetermined degree.

10. In a projector lamp, an electrode, a plurality of gripping members engaging said electrode, means for reciprocating said members in feeding direction and in counter-feeding direction, said means comprising a feeding member for moving a plurality of said gripping members simultaneously in feeding direction, and a cam normally in lowered position out of engagement with said gripping members and adapted to be raised to effective position to engage and return said gripping members one at a time in the opposite direction, and means whereby said cam is raised to effective position by burning away of the electrode to a predetermined degree.

11. In a projector lamp, an electrode, a plurality of gripping members resiliently engaging said electrode, said electrode and members being integrally rotatable, means for reciprocating said members in feeding direction and in counter-feeding direction, said means comprising a cam engageable by said gripping members during rotation thereof to move said members in feeding direction, and a cam normally in lowered position out of the path of said members and adapted to be raised to effective position, into the path of said members to engage and return said members one at a time in the opposite direction, and means whereby said cam is raised to effective position by burning away of the electrode to a predetermined degree.

12. In a projector lamp, a hub, a collar rotatably mounted on said hub, an electrode extending through said hub, a plurailty of gripping members carried by said collar and yieldingly gripping said electrode, means for rotating said collar, said hub having a cam engageable by said gripping members and so positioned as to move said members in feeding direction during rotation of said collar.

13. In a projector lamp, a hub, a collar rotatably mounted on said hub, an electrode extending through said hub, a plurality of gripping members carried by said collar and yieldingly gripping said electrode, means for rotating said collar, said hub having a cam engageable by said gripping members and so positioned as to move said members in feeding direction to the steepest point of said cam, and means for returning said gripping members one at a time to the lowest point of said cam.

14. In a projector lamp, an electrode, a plurality of gripping members resiliently engaging said electrode, means for rotating said electrode by rotating said members, a cam engageable by said members and so positioned as to move said members in feeding direction to the steepest point of said cam, and means for returning said gripping members in rotation to the lowest point of said cam.

15. In a projector lamp, an electrode, a plurality of gripping members resiliently engaging said electrode, means for rotating said electrode by rotating said members, a cam engageable by said members and so positioned as to move said members in feeding direction to the steepest point of said cam, a cam to engage and return said gripping members in rotation to the lowest point of said cam, and means whereby said cam is rendered effective by burning away of the electrode to a predetermined degree.

16. In a projector lamp, an electrode, a plurality of gripping members resiliently engaging said electrode, means for rotating said electrode by rotating said members, a cam engageable by said members and so positioned as to move said members in feeding direction to the steepest point of said cam, a cam normally in ineffective position out of engagement with said gripping members and adapted to be moved to effective position to engage and return said gripping members in rotation to the lowest point of the cam, and means whereby said cam is moved to effective position by burning away of the electrode to a predetermined degree.

17. In a projector lamp, a hub, a collar rotatably mounted on said hub, an electrode extending through said hub, a plurality of gripping members carried by said collar and resiliently gripping said electrode, means for rotating said collar, said hub having a cam engageable by said gripping members and so positioned as to move said members in feeding direction to the steepest point of said cam, a cam to engage and return said gripping members one at a time to the lowest point of the cam, and means whereby said cam is rendered effective by burning away of the electrode.

18. In a projector lamp, a hub, a collar rotatably mounted on said hub, an electrode extending through said hub, a plurality of gripping members carried by said collar and resiliently gripping said electrode, means for rotating said collar, said hub having a cam engageable by said gripping members and so positioned as to move said members in feeding direction to the steepest point of said cam, and a cam normally in ineffective

position out of engagement with said gripping members and adapted to be moved to effective position to engage and return said gripping members one at a time to the lowest point of the cam, and means whereby said cam is raised to effective position by burning away of the electrode to a predetermined degree.

19. In a projector lamp, an electrode, a plurality of gripping members resiliently engaging said electrode, means for rotating said electrode by rotating said members, a cam engageable by said members and so positioned as to move said members in feeding direction to the steepest point of said cam, a second cam means whereby said second cam is rendered effective by burning away of the electrode to a predetermined degree to engage and return said gripping members one at a time to the lowest point of said first cam and rendered ineffective when said electrode reaches a predetermined position.

20. In a projector lamp, an electrode, a plurality of gripping members resiliently engaging said electrode, a feeding member for moving said gripping members in feeding direction a predetermined distance, means rendered effective by burning away of the electrode to a predetermined degree for returning said members only one at a time to the starting position, and means for rendering said last-named means ineffective when said electrode reaches a predetermined position.

21. In a projector lamp, an electrode, and means for feeding said electrode, said means comprising a brush-holder, a plurality of current conducting brushes in said holder and engaging said electrode, and means for moving said brushes in said holder axially of said electrode in feeding direction.

22. In a projector lamp, an electrode, and means for feeding said electrode, said means comprising a brush-holder, a plurality of brushes in said holder and engaging said electrode, means for moving said brushes in said holder axially of said electrode in feeding direction, and means for returning said brushes less than half at a time to the starting position.

23. In a projector lamp, an electrode, and means for feeding said electrode, said means comprising a plurality of current conducting brushes in resilient engagement with said electrode, and means for moving said brushes axially of said electrode in feeding direction.

24. In a projector lamp, an electrode, and means for feeding said electrode, said means comprising a plurality of brushes in resilient engagement with said electrode, means for moving said brushes axially of said electrode in feeding direction, and means rendered effective by burning away of the electrode to a predetermined degree for returning said brushes one at a time to starting position.

25. In a projector lamp, an electrode, and means for feeding said electrode, said means comprising a plurality of brushes in resilient engagement with said electrodes, means for moving said brushes axially of said electrode in feeding direction, means rendered effective by burning away of the electrode to a predetermined degree for returning said brushes one at a time to starting position and rendered ineffective when said electrode is fed to a predetermined position.

26. In a projector lamp, an electrode, a hub, a brush-holder rotatably mounted on said hub, a plurality of brushes slidable in said holder and resiliently engaging said electrode, a cam on said hub, a pin fixed to each of said brushes and engaging said cam, and means for rotating said holder to cause movement of said brushes in feeding direction.

27. In a projector lamp, an electrode, a hub, a brush-holder rotatably mounted on said hub, a plurality of brushes slidable in said holder and resiliently engaging said electrode, a cam on said hub, a pin fixed to each of said brushes and engaging said cam, said pins being positioned parallel to the axis of said electrode and substantially perpendicular to said cam so that rotation of said holder causes movement of said brushes in feeding direction to the steepest point of said cam.

28. In a projector lamp, an electrode, a hub, a brush-holder rotatably mounted on said hub, a plurality of brushes slidable in said holder and resiliently engaging said electrode, a cam on said hub, a pin fixed to each of said brushes and engaging said cam, said pins being positioned parallel to the axis of said electrode and substantially perpendicular to said cam so that rotation of said holder causes movement of said brushes in feeding direction to the steepest point of said cam, a cam member normally in ineffective position out of the path of said pins but adapted to be moved to effective position in said path to engage said pins and return said brushes to the lowest point of said cam, and means whereby said cam is moved to effective position when the electrode burns away to a predetermined degree.

29. In a projector lamp, an electrode, a hub, a brush-holder rotatably mounted on said hub, a plurality of brushes slidable in said holder and resiliently engaging said electrode, a cam on said hub, a pin fixed to each of said brushes and engaging said cam, said pins being positioned parallel to the axis of said electrode and substantially perpendicular to said cam so that rotation of said holder causes movement of said brushes in feeding direction to the steepest point of

said cam, a cam member normally in ineffective position out of the path of said pins but adapted to be moved to effective position in said path to engage said pins and return said brushes to the lowest point of said cam, means for moving said second cam to effective position when the electrode burns away to a predetermined degree, and means for moving said second cam to ineffective position when said electrode is fed to a predetermined point.

In testimony whereof I have affixed my signature.

PRESTON R. BASSETT.