

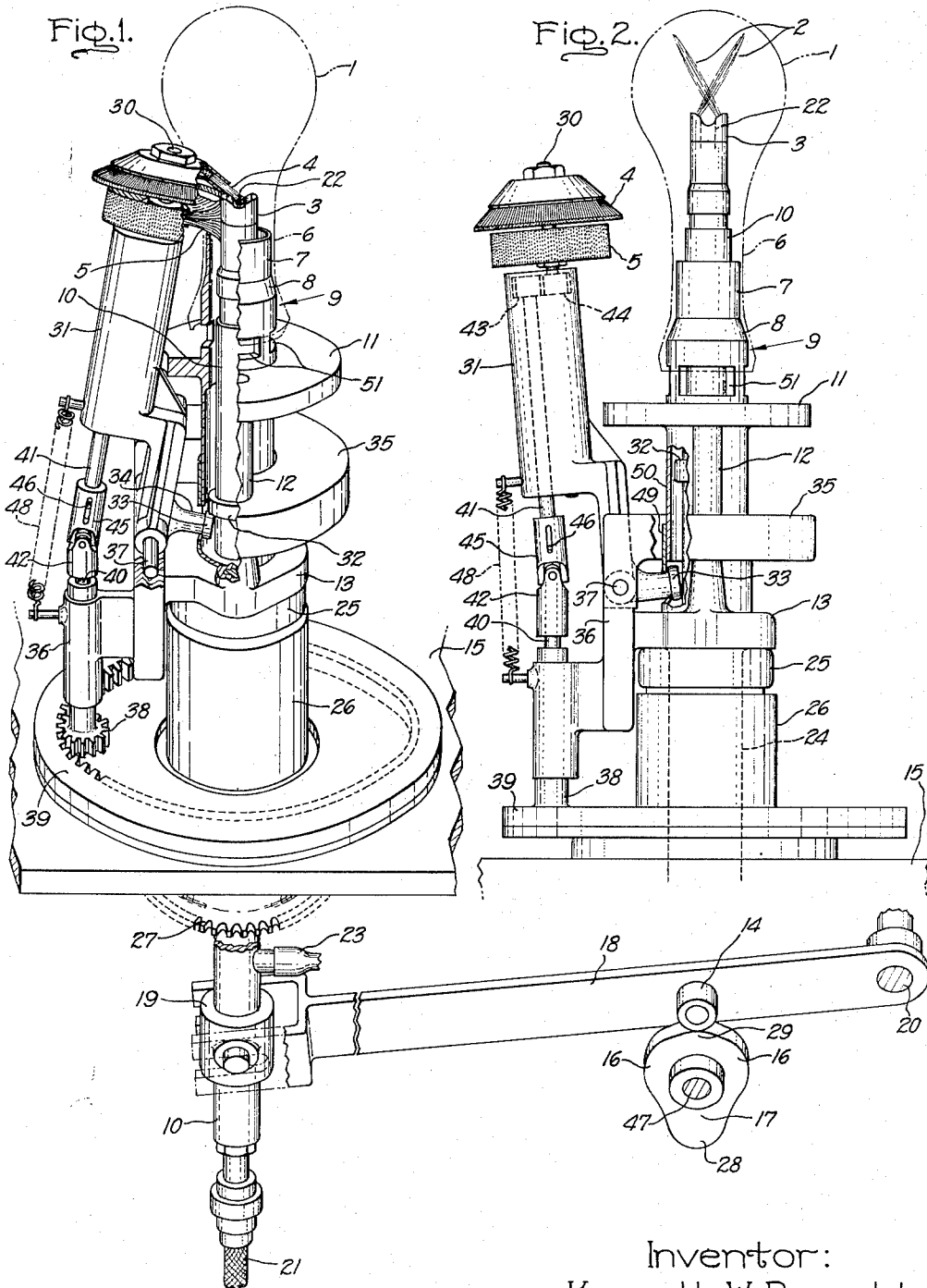
April 22, 1952

K. W. REYNOLDS

2,593,920

BRUSHING APPARATUS FOR BURNERS

Filed July 14, 1950



Inventor:
 Kenneth W. Reynolds,
 by *Vernon C. Kauffman*
 His Attorney.

UNITED STATES PATENT OFFICE

2,593,920

BRUSHING APPARATUS FOR BURNERS

Kenneth W. Reynolds, Mayfield Heights, Ohio,
assignor to General Electric Company, a corporation of New York

Application July 14, 1950, Serial No. 173,701

10 Claims. (Cl. 118—48)

1

My invention relates to apparatus for brushing the end and adjacent peripheral portions of a burner to remove solid products of combustion therefrom. My invention relates in particular to automatic apparatus for periodically brushing the end and immediately adjacent side portions of a burner to remove relatively loosely held products of combustion therefrom and thereby restore the burner to its original effectiveness.

The brushing apparatus of this invention is particularly adapted to remove the very small and adherent particles of silica deposited upon a burner of the type used to produce and deposit a light-diffusing material on incandescent lamp bulbs. According to the disclosure of M. Pipkin in patent application Serial No. 878, filed January 7, 1948, now Patent No. 2,545,896, a light-diffusing material of very desirable utility can be produced on the inside of a lamp bulb by suitably burning a combustible silicon compound such as ethyl silicate therein. The light-diffusing particles are of such small size that they form a fume in the general area of the burning and are, therefore, in such close proximity to the burner that a certain proportion thereof deposits on said burner and interferes with the proper operation thereof.

One object of my invention is to provide apparatus for brushing the exterior of a burner to rid it of solid products of combustion deposited thereon and thereby restore it to proper operating condition.

Another object of my invention is to provide apparatus for automatically brushing the top and side portions of a burner upon movement of said burner to a retracted position to remove solid products of combustion therefrom.

Still another object of my invention is to provide automatically operated brushing apparatus adapted to move to and from operative relation to a burner between successive cycles of operation thereof during which said burner is lowered to a retracted position and the brush is moved about the full periphery of said burner.

Other objects and advantages of the apparatus of my invention will appear from the following detailed description of a preferred form of said invention which is shown in the accompanying drawing. Said preferred form of the invention is comprised of rotated wire brushes mounted for movement about the top end of a spindle carrying the burner, and of operating means for said brushes taking both the rotating and moving forces from relative rotative movements between the burner and article-holding means. Other

2

means are also provided to advance the brushes to and from operative relation to the burner in accordance with longitudinal movements of a support spindle for said burner; the movement of said spindle being used both for carrying said burner from an operative to a retracted position and to advance the brushes against the burner.

In the drawing, Fig. 1 is a perspective view of brushing apparatus of my invention in combination with a burner and associated apparatus for applying a light-diffusing material to a bulb, the apparatus being broken away in part to more clearly show the cooperating features thereof; and Fig. 2 is a side elevation of brushing apparatus in a retracted position with relation to the burner and associated apparatus.

Repeated cycles of operation of the apparatus appearing in the drawing provide an interval during which a lamp bulb, indicated at 1, is coated on the inner surface by particles thrown off the flame 2 over the upper end of the burner 3 and another interval during which such particles as deposit on the end and adjacent side portions of the burner 3 are removed by the movement of the rapidly rotating brushes 4 and 5 thereagainst. Between the first-mentioned interval, during which the bulb 1 is coated, and the last-mentioned interval, during which said burner 3 is retracted and is inoperative, relatively short rest periods occur in which the bulb 1 is inserted and removed from the apparatus. During the course of the loading, coating and unloading operations, the brushes 4 and 5 (Fig. 2) lie to the side of the space occupied by the bulb 1 and the burner 3 and have no operative function.

The cycle of operation of the apparatus is initiated by the act of placing the bulb 1 in an inverted position over the burner 3 and consists in slipping the open neck 6 thereof over the upstanding flange 7 and onto the flared portion 8 of the holder 9. The flange 7 and the flared portion 8 align the bulb 1 with a spindle 10 carrying the burner 3 and fix said bulb 1 at a definite height in the apparatus in that the holder 9 extends upward from an upper platform 11 on two diametrically opposite posts 12 (only one post is shown) on the main support platform 13 of said apparatus. The burner 3, on the other hand, is retained at a height determined by the vertical position of the spindle 10 within the main support platform 13 and, at that time, is at a partially raised or loading position since the roller 14 of the operating means there-

3

for is resting upon one of the two intermediate portions 16 of the cam 17. The arm 18 of the operating means furnishes the support for the spindle 10 which it engages through the collar 19 and holds said spindle 10 at a position determined by its rotative position about a stationary pivot shaft 20 attached to the frame (not shown) of the apparatus.

At the moment the cycle of operation is initiated by the insertion of the bulb 1, relatively long flames 2 of burning ethyl silicate are projected from the top of the burner 3 and relatively concentrated streams of silica particles, the solid product of the combustion, are caused to wipe and, accordingly, fix themselves to the neck 6 of the bulb 1. This manner of effecting a controlled discharge of the silica particles, which are extremely efficient and effective light-diffusing bodies, is brought about by the controlled feeding of liquid ethyl silicate to the burner 3 through a vertical passage (not shown) extending through the center of the spindle 10 and connected to a source thereof by the flexible pipe 21 at the lower end of said spindle 10. The heat contained within the burner 3 vaporizes the ethyl silicate which is allowed to rise from an open well 22 at the center of said burner 3 and which is immediately pulled into streams of oxygen discharged from offset outlets on opposite sides of the well 22. The particular burner 3 shown in the illustration is shown in greater detail and claimed in United States patent application of R. A. Kuebler, Serial No. 171,186, filed June 29, 1950, and assigned to the same assignee as this application. The oxygen is introduced into the burner 3 from a connecting passage extending through the full length of the spindle 10 to a source of supply herein represented by the flexible hose 23 on the lower portion of said spindle 10.

Proper distribution of silica particles over the full circumference of the neck 6 of the bulb 1 is effected by the relative rotative movement which occurs between the burner 3 and the bulb 1 at all times since the holder 9 is constantly under the rotative influence of the main support platform 13. A depending sleeve portion 24 on the support platform 13 extends through the ball bearing 25 and the journal 26 on the table 15 to a sprocket 27 which imparts rotation to the assembly by engagement with a chain (not shown) connecting it to a source of motion. The relative rotative motion of the bulb 1 and burner 3 causes the flames 2 and the streams of silica particles projected thereby to sweep completely around the neck 6 of the bulb 1 and, accordingly, assists in causing a uniform deposit of particles thereon.

The distribution of silica particles along the length of the bulb 1 is an independent function of the apparatus and is produced by vertical movements in the burner 3. This vertical motion occurs almost immediately after the bulb 1 is placed in position on the holder 9, when continuing rotation of the cam 17 of the operating means advances the high part 28 into position below the roller 14, and continues at a rate determined by the rate of change in said cam 17 until finally said burner 3 reaches the upper limit of its travel, the position at which it appears in Fig. 2. The rate of movement of the burner 3 is slower during the upper portion of its motion in that the silica particles must be deposited upon a greater area of the bulb 1 and is interrupted momentarily at the top of its

4

stroke to provide a coating over the end of the bulb 1. The return downward motion occurs when the high part 28 of the cam 17 is turned beyond the roller 14 and is continuous until the second intermediate portion 16 is engaged thereby. At that time, the burner 3 is located at the level at which it started the cycle of operation and the bulb 1, which is now completely coated with silica particles, is lifted off the holder 9.

The next step in the operation of the apparatus consists of another downward movement in the burner 3 effected by further rotation of the cam 17, whereby the low part 29 thereof is positioned below the roller 14, and carries the burner 3 to the retracted position at which it is shown in Fig. 1. This latter movement of the burner 3 also places in operation the brushing means of the apparatus which means provides for the removal of those particles of silica which have become attached to the top end and sides of the burner 3. The additional downward travel of the spindle 10 at such times causes the brushes 4 and 5, which are mounted on a shaft 30 journaled in the lever 31, to swing in against said burner 3 as shown in Fig. 1 since the fixed collar 32 on said spindle 10 then presses against the roller 33 on the projecting arm 34 on the lever 31 and rocks it in toward said burner 3. The brushes 4 and 5 effect their cleaning action by being driven at a sufficiently high speed about the axis of the shaft 30 to effectively remove all but the extremely hard incrustation that gradually develops on the burners 3 and effect contact with the full periphery of the burner 3 by being carried thereabout by the much slower rotation of the lever 31 around the spindle 10. The brushes 4 and 5 are rotated about the spindle 10 by the continuously occurring rotative motion of the holder 9 and the main support platform 13 since the support lever 31 therefor is located within an open section of the flange 35 of the bracket 36 which is in turn fastened to the main support platform 13 and which is accordingly rotated with the holder 9. The pin 37 which traverses the open section of the flange 35 provides the support for lever 31. The means of rotating brushes 4 and 5 is also present in the means for effecting the relative rotative movements of the lever 31 and the spindle 10 in that rapid rotation is effected in the spur gear 38 on the depending portion of bracket 36 during the course of its travel around the inside of the stationary internal gear 39 which is attached to the flange on the journal 26. A shaft 40 retained by the bracket 36 transfers the rotation of spur gear 38 to the substantially vertical shaft 41 in the lever 31 by means of the universal joint 42, and a train of gears 43 and 44, within a recessed pocket in the upper end of the lever 31, in turn, transfers the motion of shaft 41 to the shaft 30 supporting the brushes 4 and 5. The drive for the brushes 4 and 5 is required to lengthen when they are moved in against the burner 3; and, accordingly, a slip joint is provided in said drive by arranging the lower end of the vertical shaft 41 so that it is free to slide longitudinally in the upper end 45 of the universal joint 42 and so that it is keyed thereto by the cross pin 46 in the slot in said upper end 45.

The brushes 4 and 5 remain in operative relation to the burner 3 only for a sufficiently long interval to allow them to completely circle said burner 3 at which time the uniform speed of rotation of the shaft 47 turns the cam 17 so that

5

the roller 14 passes onto one of the intermediate portions 16 thereof, and the spindle 10 is lifted to the loading position. The outward swing of the lever 31 occurs when the collar 32 is moved up by the spindle 10 and the contraction force of the spring 48 which extends between posts in said lever 31 and the bracket 36 is allowed to swing the said lever 31 outward. At the limit of movement, the arm 34 on the lever 31 engages the top of the opening in the tubular shield 49 surrounding that portion of the spindle 10 adjacent the lower platform 13 which opening is large enough to allow free movement thereof at other moments during the operation of the apparatus. The tubular shield 49 also has the function of cooperating with the depending tubular shield 50 attached to the upper platform 11 to keep the free particles of silica about the general area of the apparatus from depositing on that portion of the spindle 10 which moves in and out of the main support platform 13. Means are also provided in the collar 32 for preventing the free silica particles within the bulb 1 from circulating down through the hollow center of the holder 9 and said shields 49 and 50 to the joint between the spindle 10 and the lower platform 13; however, free passage of said particles can occur to the surrounding atmosphere through the vent openings 51 in the holder 9. The continuous rotation of the cam 17 causes a repeat series of operations to occur at regular intervals in succeeding cycles of operation like that just described.

Although a preferred embodiment of my invention has been disclosed, it will be understood that the invention is not limited to the exact disclosure shown, but that the elements of the invention may be widely modified within the spirit and scope defined by the appended claims.

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

1. A burner system including a brushing apparatus for removing products of combustion from the outer surface of a burner comprising a longitudinally movable spindle, a burner mounted on one end of the spindle, a rotatable brush, a brush-supporting lever having an arm supporting said brush and pivoted at one side and movable toward and away from the spindle, said lever having an operating arm extending to a position adjacent the spindle, means for moving the spindle longitudinally to operative and retracted positions and means attached to the spindle and engaging the operating arm of the lever during the longitudinal retracting movement of said spindle and the burner for causing the lever to advance the brush against the burner.

2. A burner system including a brushing apparatus for removing products of combustion from the outer surface of a burner comprising a longitudinally movable spindle, a burner mounted on one end of the spindle, a rotatable brush having peripheral portions substantially parallel and substantially perpendicular to the axis of rotation, a brush-supporting lever having an arm supporting said brush and pivoted at one side and movable toward and away from the spindle, said lever holding the brush on an axis substantially parallel to said spindle and having an operating arm extending to a position adjacent thereto, means for moving the spindle longitudinally to operative and retracted positions, and means attached to the spindle and engaging the operating arm of the lever during the longitudinal retracting movement of said spindle and the burner

6

for causing the lever to advance the brush against the side and end of the burner.

3. A burner system including a brushing apparatus for removing products of combustion from the outer surface of a burner comprising a longitudinally movable spindle, a burner mounted on one end of the spindle, a rotatable brush, a brush-supporting lever having an arm supporting said brush and pivoted at one side and movable toward and away from the spindle, said lever having an operating arm extending to a position adjacent the spindle, means for moving the spindle longitudinally to operative and retracted positions, means attached to the spindle and engaging the operating arm of the lever during the longitudinal retracting movement of said spindle and the burner for causing the lever to advance the brush against the burner, and means for moving the brush support lever about the spindle to cause the brush to engage the full periphery of the burner.

4. A burner system including a brushing apparatus for removing products of combustion from the outer surface of a burner comprising a longitudinally movable spindle, a burner mounted on one end of the spindle, a rotatable brush, a brush-supporting lever having an arm supporting said brush and pivoted at one side and movable toward and away from the spindle, said lever having an operating arm extending to a position adjacent the spindle, means for moving the spindle longitudinally to operative and retracted positions, means attached to the spindle and engaging the operating arm of the lever during the longitudinal retracting movement of said spindle and the burner for causing the lever to advance the brush against the burner, means for moving the brush support lever about the spindle to cause the brush to engage the full periphery of the burner, means mounted on the brush support lever for effecting the rotation of said brush, and stationary means located around the spindle and engaged by the last-mentioned means for causing the relative movement of the latter to effect its operation.

5. A burner system including a brushing apparatus for removing products of combustion from the outer surface of a burner comprising a longitudinally movable spindle, a burner mounted on one end of the spindle, a rotatable brush, a brush-supporting lever having an arm supporting said brush and pivoted at one side and movable toward and away from the spindle, said lever having an operating arm extending to a position adjacent the spindle, means for moving the spindle longitudinally to operative and retracted positions, means attached to the spindle and engaging the operating arm of the lever during the longitudinal retracting movement of said spindle and the burner for causing the lever to advance the brush against the burner, means for moving the brush support lever about the spindle to cause the brush to engage the full periphery of the burner, and means for effecting rotation of the brush comprising a stationary internal gear on the axis of the spindle and adjacent the path of travel of the brush-supporting lever, and a gear mounted for movement with the brush-supporting lever and engagement with the internal gear so that the movement of said lever imparts rotation to said gear and to the brush.

6. A burner system including a brushing apparatus for removing products of combustion from the outer surface of a burner comprising a ro-

7

tatable holder for supporting a hollow article, a longitudinal movable spindle extending through the holder along the axis of rotation thereof, a burner mounted upon the extending end of the spindle, means engaging a midportion of the spindle for supporting and rotating the holder, means for moving the spindle longitudinally to position the burner at operative relation to an article held by the holder and at a retracted position, a rotatable brush, a brush-supporting lever having an arm supporting said brush and pivoted on the holder support means for movement toward and away from the burner at the retracted position thereof, said lever having an operating arm extending to a position adjacent the spindle, and means attached to the spindle and engaging the operating arm of the brush-supporting lever at the retracted position of the spindle for causing said lever to advance the brush against the burner.

7. A burner system including a brushing apparatus for removing products of combustion from the outer surface of a burner comprising a rotatable holder for supporting a hollow article, a longitudinal movable spindle extending through the holder along the axis of rotation thereof, a burner mounted upon the extending end of the spindle, means engaging a midportion of the spindle for supporting and rotating the holder, means for moving the spindle longitudinally to position the burner at operative relation to an article held by the holder and at a retracted position, a rotatable brush, a brush-supporting lever having an arm supporting said brush and pivoted on the holder support means for movement toward and away from the burner at the retracted position thereof, said lever having an operating arm extending to a position adjacent the spindle, means attached to the spindle and engaging the operating arm of the brush-supporting lever at the retracted position of the spindle for causing said lever to advance the brush against the burner, and means for causing rotation of the brush comprising stationary means adjacent the holder support means and means mounted on said holder support means at a position to engage said stationary means and be rotated by the relative motion therebetween.

8

8. In a burner system including a brushing apparatus, the combination of a burner, a spindle carrying said burner at one end thereof, means mounting said spindle for longitudinal reciprocating motion between operative and retracted positions, a rotatable brush, support means holding said brush adjacent said spindle, and means operative upon retraction of said spindle and burner to advance said brush into engagement with the end of said burner.

9. In a burner system including a brushing apparatus, the combination of a burner, a spindle carrying said burner at one end thereof, means mounting said spindle for longitudinal reciprocating motion between operative and retracted positions, a rotatable brush, support means holding said brush adjacent said spindle and including means for rotating said brush about both its own axis and the axis of said spindle, and means operative upon retraction of said spindle and burner to advance said brush into engagement with the end of said burner.

10. In combination, a hollow rotatable holder for supporting a hollow article on the end thereof, a spindle extending longitudinally through said holder, a burner carried by said spindle, means for reciprocating said spindle through said holder to carry said burner from a retracted position adjacent the said end of the holder to an advanced operative position, a rotatable brush, means supporting said brush from said rotatable holder for rotation therewith about the axis of said holder and including means for also rotating said brush about its own axis, and means operative upon retraction of said spindle and burner to advance said brush into engagement with the end of said burner.

KENNETH W. REYNOLDS.

REFERENCES CITED

The following references are of record in the file of this patent:

FOREIGN PATENTS

Number	Country	Date
206,053	Germany	Jan. 23, 1909
463,051	France	Dec. 6, 1913