

June 17, 1947.

W. P. ZABEL

2,422,457

COATING APPARATUS

Filed Aug. 10, 1944

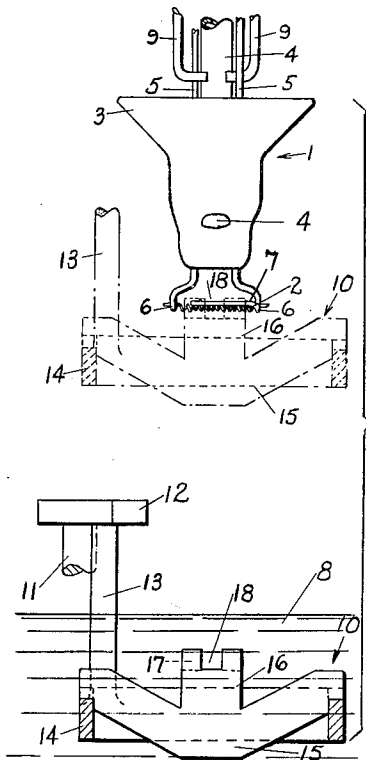


FIG. 1.

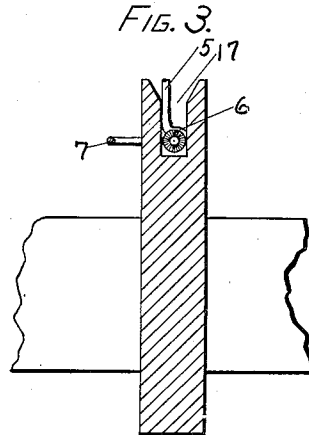


FIG. 3.

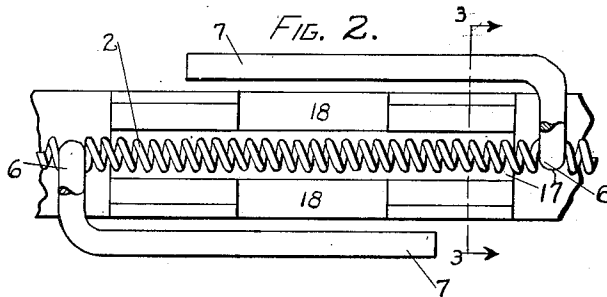


FIG. 2.

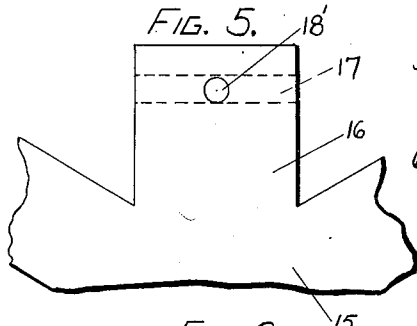


FIG. 5.

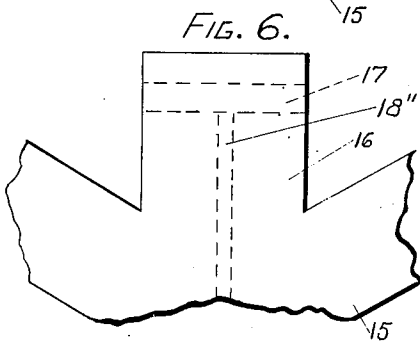


FIG. 6.

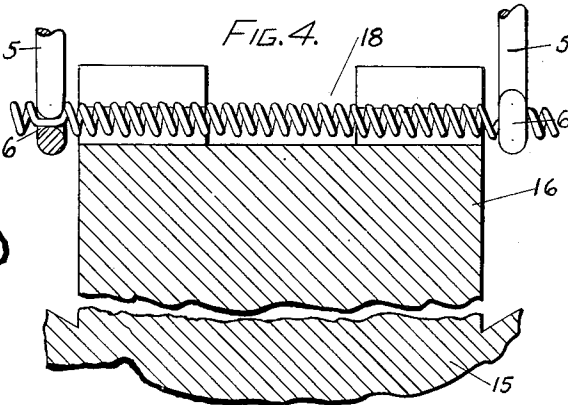


FIG. 4.

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2,422,457

COATING APPARATUS

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Application August 10, 1944, Serial No. 548,852

2 Claims. (Cl. 91—47)

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This invention relates to coating filaments or the like for electric lamps and discharge devices, and particularly to applying liquid or fluent material to filaments. The invention is explained hereinafter with particular reference to coating or filling a coiled filament forming part of a lamp mount without putting the material on the joints between the leads and the filament, or on other parts close to the filament, as described in application Serial No. 488,955 of John Flaws, Jr., filed May 29, 1943, and assigned to the assignee of this application, now Patent No. 2,363,055, dated November 21, 1944.

In the drawings Fig. 1 is a side view, partly sectional, showing the essential parts of an apparatus including my invention, and illustrating its operation; Fig. 2 is a plan view of an applicator part embodying the invention in cooperative relation to a filament and its lead wires; Fig. 3, is a corresponding cross-section, on a smaller scale, taken as indicated by the line and arrows 3—3 in Fig. 2; and Fig. 4 is a side view corresponding to Fig. 2, showing the principal applicator part in longitudinal mid-section, but omitting the auxiliary anodes of the mount illustrated in the other figures.

Figs. 5 and 6 are side views illustrating modified forms of applicator.

Fig. 1 illustrates a mount 1 carrying a coiled filament 2 that is to be coated or charged with material by means of the applicator of this invention. The mount 1 comprises a flare or stem tube 3, an exhaust tube 4, and current lead wires 5, 5 which extend through the seal joining the stem and exhaust tubes. The seal has an opening affording passage through the stem into the exhaust tube 4, as usual. At the inner side of the seal, the leads 5, 5 are spread apart and bent to form hooks 6, 6 in which are clamped the ends of the coiled tungsten wire filament 2. As shown in Fig. 2, the extremities 7, 7 of the lead wires beyond the hooks 6, 6 may be bent to extend parallel to the filament 2 at opposite sides thereof, as described in U. S. Patent No. 2,312,245 of John Flaws, Jr., granted February 23, 1943.

When mounts of the general character described are used in a gaseous electric discharge lamp, like the ordinary low-pressure positive column fluorescent lamp containing mercury and starting gas such as argon, two of these mounts 1 are sealed into opposite ends of a tubular envelope, not shown, and their filaments 2 serve as cathodes, while the lead-wire extremities 7, 7 serve as auxiliary anodes. To render the filaments 2 electron-emissive, they are coated or

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charged before sealing in which "emission mix," as it is termed, consisting of finely divided material, such as alkaline earth carbonates including those of barium and strontium, suspended in an organic binder such as a lacquer of low-viscosity nitrocellulose, which is applied as liquid and allowed to dry. After sealing in, the filaments 2 are subjected to suitable heat treatment to eliminate the binder and the gaseous components of the applied material, convert the carbonates to oxides, and render the latter freely emissive; and for this purpose, heating current is passed through the filaments 2. As the leads 5, 5, the hooks 6, 6, and the portions of the filaments 2 near the hooks are not thus effectively heated, and as the anodes 7, 7 are not intended to be emissive during operation of the lamp, it is undesirable to put any material on these parts. On the other hand, it is very desirable to coat or charge the filament 2 of the mount 1 uniformly and liberally with the material throughout most of its length, without any localization of an extra quantity anywhere.

It is to meet these exacting requirements satisfactorily that the applicator of this invention has been devised.

As described in the aforesaid Flaws Patent No. 2,363,055, dated November 21, 1944, there is a reservoir or cup (not shown) containing a bath or pool of the liquid 8. Above the liquid bath 8, the mount 1 is supported filament down, as by means of a holder comprising jaws 9, 9 that grip the exhaust tube 4. These jaws 9, 9 may form part of a head (not shown) that is moved along horizontally and stepwise by a suitable carrier or turret (as shown in application Serial No. 426,766, of John Flaws, Jr., filed January 14, 1942, and assigned to the assignee of this application, now Patent No. 2,380,742, dated July 31, 1945), pausing awhile over the liquid 8. For application to the filament 2, some of the liquid material 8 may be carried up to the filament 2 by a dipping device 10 which is normally submerged in the liquid bath or pool 8, but is periodically raised to the position shown in dot and dash lines. The device 10 may be moved up and down or reciprocated vertically by any suitable means (such as a cam, not shown) acting through a vertical rod 11, a head 12, and a stem 13, these parts being arranged behind the plane of section in Fig. 1 so as to clear the mount flare 3 in their movements. As shown in Fig. 1, the stem 13 is attached to an annular part 14 that is open in the center, so that liquid enters its interior freely as it descends into the bath 8. Across the

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annulus 14 in a diametral plane extends a thin, flat metal bar 15 which is triangularly notched out at either side of an upstanding mid-portion 16 whose top is longitudinally grooved at 17, Figs. 2 and 3, to form a dipping and applying trough for the liquid 8. As shown in Fig. 2, the upper edges of the trough sides are sharply bevelled inward, and the shouldered ends of the bar 15 are removably fitted in notches in the top edge of the part 14. When the dipping device 10 is at its lower full-line position of Fig. 1, the applicator trough 17 is totally immersed and filled with the liquid; when the device 10 rises to its dot and dash position in Fig. 1, it carries liquid up around the coiled filament 2, which is immersed in the liquid then remaining in the trough and takes some of this liquid into its interior, partly perhaps by capillary action. In this way, the coil 2 can be completely filled with the liquid under favorable conditions. Notwithstanding that some of the liquid drains out at the trough ends as the trough rises, the liquid is applied to the filament before all the liquid drains out of the trough.

It is to be understood that in Fig. 1 the mount 1 is shown well above the liquid 8, in order that the upper and lower positions of the device 10 may appear well separated. In practice, the mount 1 may be as close as convenient to the surface of the liquid 8, to save lost motion and undesired run-back of liquid from the dipping device during its rise.

As thus far described, the device and its applicator 17 are largely similar to what is illustrated and described in the Flaws Patent No. 2,363,055. As here shown, however, the applicator trough 17 differs from the one shown in that application in that the trough 17 is considerably deeper (relative to its width and to the external diameter of the coil 2 to be charged by it), and is provided with means for draining off liquid from the trough intermediately, as well as at its ends. As one means for providing mid-length drainage, the trough sides may be notched out at mid-length, as shown at 18, substantially right down to the flat bottom surface of the trough, or nearly flush with this surface. Such mid-length drainage has proved very effective in controlling the distribution of the charge of liquid along the length of the filament 2 throughout a length of coil corresponding more or less nearly to the trough length, and in preventing any localization of an extra quantity anywhere. This is true especially in working with relatively thick, viscous liquid material 8. The improvement goes beyond mere avoidance of a dried lump of material hanging from mid-length of the coil; the coil is more completely filled, and is filled symmetrically about its axis, instead of perhaps having one side nearly empty. The length of the trough 17 is such that the application of liquid is limited to the portion of the filament 2 between the hooks 6, 6, and liquid is prevented from collecting on the leads 5 and the closely adjacent portions of the filament, where it might not afterward be heated sufficiently to get rid of all gassifiable or vaporizable matter.

Besides the size and shape of the trough 17, the period of time the filament 2 remains in the

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trough, and the viscosity of the liquid 8, the thickness or amount of the charge on or in the filament 2 can be very largely controlled by varying the width of the notches 18; or, in a similar way, identical amounts of liquids of different viscosities may be applied.

Fig. 5 illustrates a variation in which the liquid is drained off by means of holes 18' pierced through the sides of the trough 17 at mid-length.

Fig. 6 illustrates a variation in which the liquid drains downward through a vertical hole 18'' drilled in the thickness of the bar 15.

Provision may be made for keeping the liquid level in the bath 8 constant by automatically replenishing the bath as fast as it is used, in any well-known way. Provision is also preferably made for keeping the bath 8 thoroughly agitated all the time, so that its viscosity and strength shall remain essentially constant.

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

1. In apparatus of the class described comprising a reservoir for liquid coating material, an applicator member having a horizontally extending open-ended trough normally disposed in said reservoir with the trough submerged in the coating material, support means above said reservoir for supporting a filament in a horizontal position with its longitudinal axis parallel to and in alignment with the longitudinal axis of the trough, and means for carrying said applicator member upward out of the coating material to apply coating material in the trough to the filament before it drains out of the trough, the said applicator being provided with a drainage passage at the middle of the trough to permit leakage of the coating material thereat, as well as from the ends of the trough, during the upward movement of the applicator.

2. In apparatus of the class described comprising a reservoir for liquid coating material, an applicator member having a horizontally extending open-ended trough normally disposed in said reservoir with the trough submerged in the coating material, support means above said reservoir for supporting a filament in a horizontal position with its longitudinal axis parallel to and in alignment with the longitudinal axis of the trough, and means for carrying said applicator member upward out of the coating material to apply coating material in the trough to the filament before it drains out of the trough, the said applicator being provided with notches in the sides of the trough midway of its length to permit leakage of the coating material thereat, as well as from the ends of the trough, during the upward movement of the applicator.

WILLIAM P. ZABEL.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
180,454	Bowen	Aug. 1, 1876
2,360,582	Richardson	Oct. 17, 1944
2,363,055	Flaws	Nov. 21, 1944

Certificate of Correction

Patent No. 2,422,457.

June 17, 1947.

WILLIAM P. ZABEL

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Column 2, line 1, for the word "which" read *with*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 21st day of October, A. D. 1947.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.