

Sept. 7, 1943.

C. L. ALBRIGHT

2,329,024

CATHODE COATING MACHINE

Filed Nov. 23, 1940

3 Sheets-Sheet 1

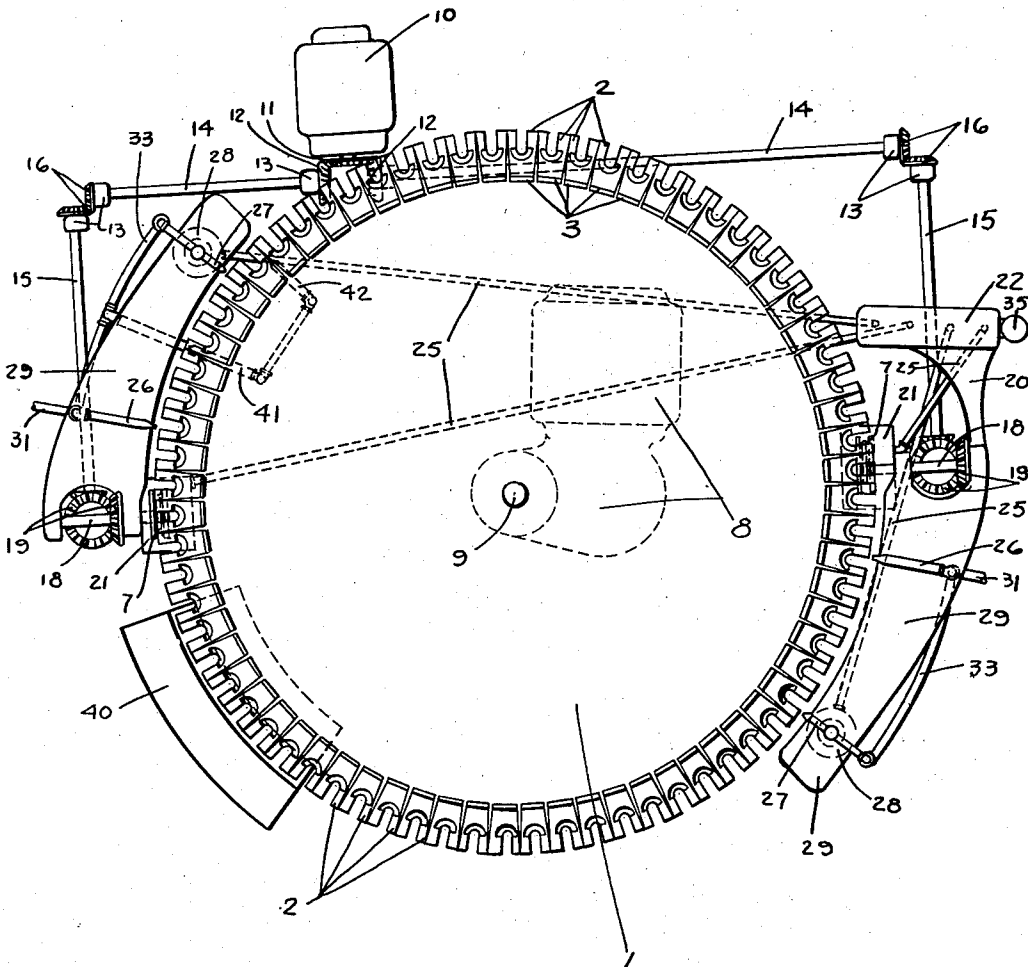


Fig. 1

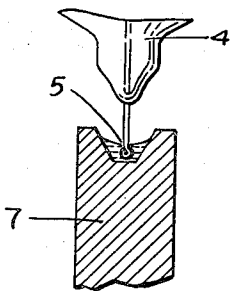


Fig. 5

Charles L. Albright,
INVENTOR.

BY Lawrence Burns,
Attorney.

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C. L. ALBRIGHT

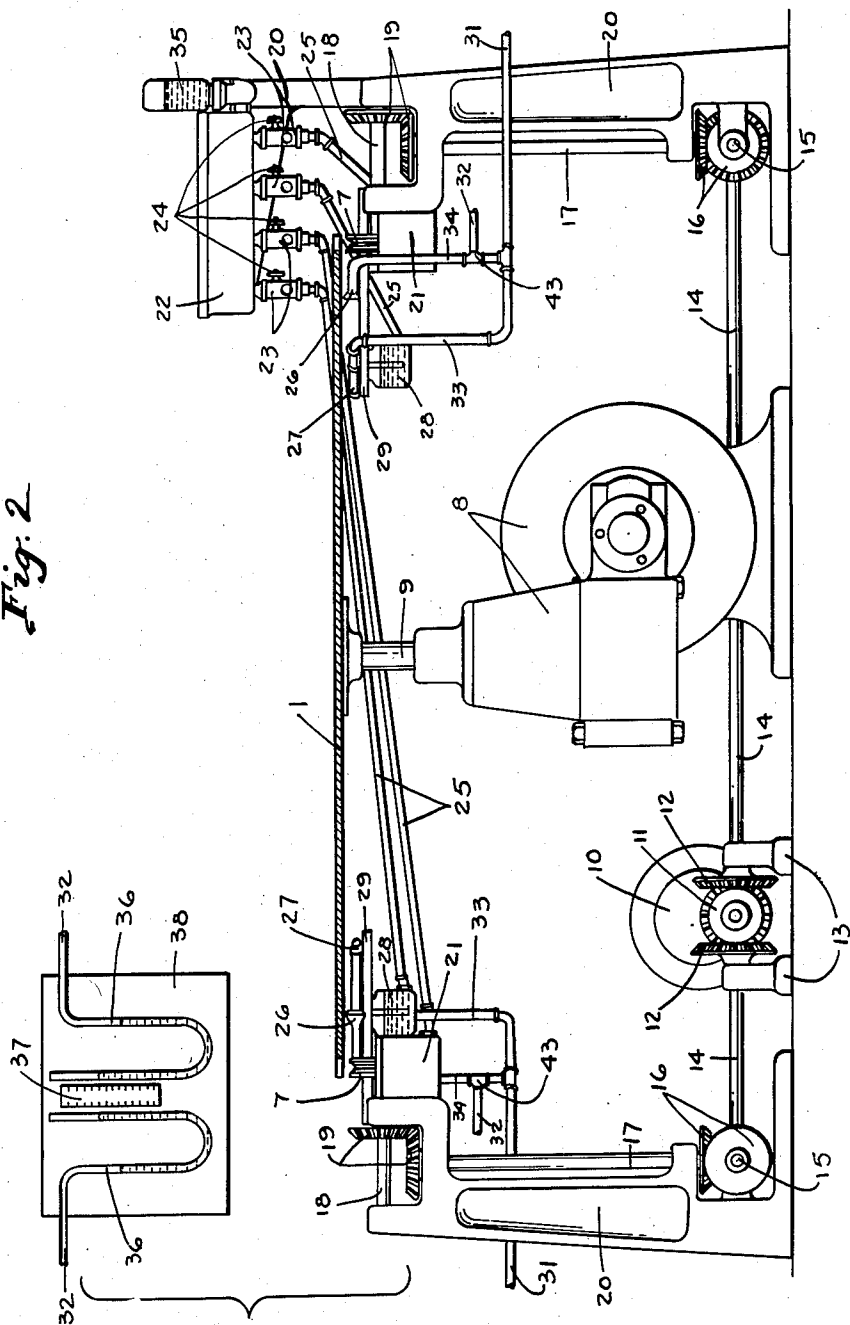
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Fig. 2



Charles L. Albright,
INVENTOR.

BY Lawrence Burns,
Attorney.

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C. L. ALBRIGHT

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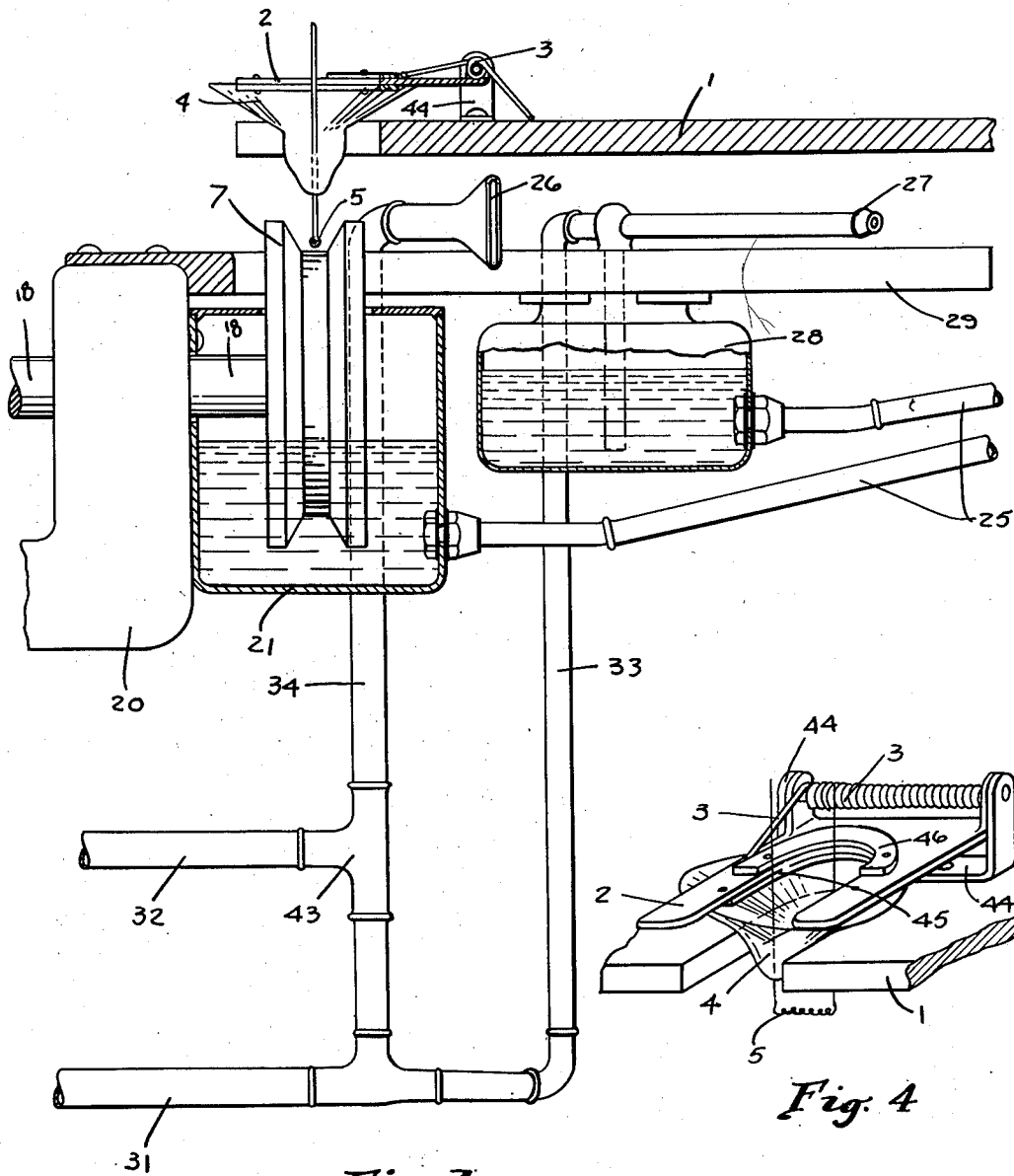


Fig. 4

Fig. 3

Charles L. Albright,
INVENTOR.

BY *Lawrence Butma,*
Attorney.

UNITED STATES PATENT OFFICE

2,329,024

CATHODE COATING MACHINE

Charles L. Albright, Beverly, Mass., assignor to
Sylvania Electric Products Inc., a corporation
of Massachusetts

Application November 23, 1940, Serial No. 366,869

11 Claims. (Cl. 91—55)

This invention relates to electric gaseous discharge lamps, and more particularly to a machine for coating the electrodes used in these lamps.

An object of this invention is to provide a machine for coating the filamentary portion of the type of electrode used in fluorescent lamps.

Another object is to provide a machine for coating this type of electrode in a manner as to insure a firmly held, evenly dispersed, coating.

A further object is to provide a machine for coating this type of electrode in a manner as to insure the complete filling of the turns of the minor coil of the electrode.

Other objects, advantages and features will be apparent from the specification below taken in conjunction with the accompanying drawings in which:

Figure 1 is a plan view of my new cathode coating machine;

Figure 2 is a side elevational view shown partly in section of this machine;

Figure 3 is a detail of the coating wheel, the atomizing and blowing nozzles and their respective pressure lines. It also shows the location of the filamentary portion of the electrode in relation to the coating wheel and the means for holding said electrode;

Figure 4 is a detail of the flare holder;

Figure 5 is a detail, shown partly in section, of the coating wheel, carrying the viscous coating to the filamentary electrode.

The filamentary portion of the electrodes sealed at the ends of electric gaseous discharge lamps are preferably coated with one or more of the alkaline earth oxides. It has been found desirable to use a coiled-coil type of wire to form the filamentary portion of the electrode. This type of filament is formed by winding the wire to form a coil and then winding the coiled wire to form the coiled-coil filament. For the purpose of clarity, the first winding of the filament wire may be called the minor coil and the winding of the minor coil may be termed the major coil. It has also been found desirable to have the coating completely fill the turns of the smaller coil. It is with this type of electrode in mind that this machine was invented.

In Figure 1, the turret 1 is actuated through the motor shaft 9 by the turret reduction gear motor 8. The turret moves continuously and in a clockwise manner as it carries the flare 4, held in the flare holders 2, through the coating cycle. The filamentary portion of the electrode is held in a downward direction so that it will become

immersed in cathode coating when it passes through the groove carrying said coating in the grooved wheel 7. This grooved wheel revolves through the container 21 in which the coating solution is held and is actuated by the shaft 19 to which it is attached. As a result of passing over this wheel, the coiled-coil filamentary electrode is completely covered with the coating material.

When the filament passes by the blowing nozzle 26, a stream of air from the air supply line 31 through blowing nozzle 26 will blow off the coating from the surface and from between the turns of the major coil. When the filament passes by the atomizer it is sprayed with a vehicle which evaporates rapidly, for example acetone, or pentacetate. This serves to evenly disperse the coating on the filament and aid in its drying as well as to further blow off the excessive coating material. The filament then continues around until it reaches the oven 40. The filament is all the time drying, so that by the time it reaches the oven 40, the coating is fairly well dried out. By passing the filament through this small oven, the coating is completely dried.

Since it has been found desirable to apply two coats of coating material to the filamentary portion of the electrode, another coat is applied. However, it should be noted that the best results of this two coat process is obtained by drying the first coat substantially before applying the second coat, thus providing a firmer base for the second coat.

After the filament has passed from the oven 40, it again becomes immersed in the cathode coating solution as a result of passing through the groove of the grooved wheel 7, which is revolving through the container 21, in which the coating solution is held. This wheel is mounted on the end of the shaft 18. Again the coiled-coil filament is passed through a flow of air from the air line 31 through the blowing nozzle 26. The coating on the surface and between the turns of the major coil is again blown off. It is further blown off by the stream of air from the cross-blowing nozzle 41. This cross blowing aids in completely removing the coating from the major coil. The filament is then sprayed with some such vehicle as acetone as described above in order to aid in dispersing and drying the coating. While the coating is still wet, it is passed through another stream of air from the final blowing nozzle 42. Thus, complete assurance is had that all excess coating has been blown off. The use of cross-

blowing nozzles insures this result. An even dispersement and complete filling of the turns of the minor coil is obtained through the spraying of the filament with a vehicle of high evaporating and shrinking qualities. The acetone or pentacetate causes the coating to shrink up and completely fill the turns of the minor coil.

In Figure 2, the turret 1 is actuated through the motor shaft 9 by the turret reduction gear motor 8. The reduction gear motor 10 drives the bevel gear 11 meshed with the bevel pinions 12. The take off shafts 14 extend from the driven bevel pinions 12 through the bearing pedestals 13 to the jack shafts 15. The shafts 17, extending up from the gear assemblies 16, project up to the top beveled gear assemblies 19 which actuate the grooved wheel shafts 18. These shafts and gear and pinion assemblies are supported from the foundation pieces 20. The grooved wheels 7 are mounted on the inner end of these grooved wheel shafts 18.

The reservoir bottle 35 is connected to the reservoir 22 mounted on top of one of the foundation pieces 20 and serves to keep the height of the liquid in the reservoir at a constant level. The sight feed gauge valves 24 on the sight feed gauges 23 control the flow of the liquid from the reservoir 22. The feed pipes 25, from these gauges 23, run to the bayonet mounted atomizer reservoir 28 and the coating solution containers 21. The purpose of having this liquid flowing into the coating solution in the containers 21 is to insure the constancy of the viscosity of the coating solution therein and maintenance of a proper level in the atomizer bottles.

The manometers 36 mounted on the manometer board 38 are connected through the control pipes 32 to the blowing nozzle pipes 34. These manometers serve as a means of measuring the pressure of the air coming out of line 31 into line 34 through the valve 43. The manometer scale 37 enables one to take a reading of this pressure.

Figure 3 shows more in detail just how the atomizers and air blowers function. This figure shows but one side of the machines. However, the atomizer and air blower assemblies on the opposite side are the same. The grooved wheel 7 driven through the shafts 18 carries the cathode coating from the containers 21. When the filamentary portion of the electrode 5 passes through the groove in the wheel 7, it will become immersed in the coating solution. As the stem passes along after having the filamentary portion of the electrode coated, the filament will pass by the blowing nozzle 26 out of which a stream of air is flowing. Since a coiled-coil filament is being used, the passing of the filament through the path of this air stream will result in the coating being blown out from between the turns of the major coil. As the stem moves along from the blowing nozzle 26, it passes by the atomizer nozzle 27 from which a spray of pentacetate or some similar vehicle is sprayed from the atomizer reservoir 28. This spraying tends to further clean off the major coil and shrink the coating so that the coating is now held within the turns of the minor coil.

Figure 4 shows the manner in which the flared portion 4 of the stem is held in the flare holder 2 attached to the turret 1 through the mounting saddles 44. The flare is held firmly within the jaws of the flare holder 2 by means of the tension through the mouse trap spring 3. This flare holder may have the jaws thereof adaptable to hold flares of different sizes. For example, a larger flare would rest solely on the outer step

of the flare holder 2 whereas a smaller flare would rest solely on the inner horseshoe 45 of the flare 2. The ring 46 serves as a stiffener. Although this type of flare holder is manually operated, other flare holders manually or mechanically operated may very readily be adapted to my machine without departing from the spirit of my invention.

What I claim is:

1. A machine for treating electric discharge lamp cathodes of the coiled-coil type having a major and a minor coil, said machine comprising: a conveyor for carrying said cathode through a plurality of stations; means at one of said stations for filling the coils of said cathode with a suspension of electron-emitting material; blowing means at a second of said stations for removing said suspension from the inside of the major coil; means at a third station for spraying a quick-drying solvent on said cathode to concentrate said suspension within the minor coil.

2. A machine for treating electric discharge lamp cathodes of the coiled-coil type having a major and a minor coil, said machine comprising: a conveyor for carrying said cathode in a fixed path through a successive plurality of stations; a rotatable wheel at one of said stations and having a groove carrying a suspension of electron-emitting material in the path of the cathode through said station; means at a second station for blowing air on said cathode transversely to the path of said cathode through said station to remove the said suspension from the major coil but not from the minor coil; and an atomizer at a third station for spraying a quick-drying solvent on said coil to concentrate said suspension within the minor coil.

3. A machine for treating a cathode, with a suspension of an electron emissive material, said machine comprising: a conveyor movable through a definite path; means for suspending a cathode from said conveyor, said suspending means being so mounted on said conveyor as to carry a cathode suspended thereby through a definite path in accordance with the movement of said conveyor; means for disposing a quantity of said suspension in the path of said cathode; a source of air disposed to direct a stream of air transversely through the path of said cathode; and a spray gun disposed to spray a quantity of a quick drying solvent transversely through the path of said cathode.

4. A machine for treating electric discharge lamp cathodes of the coiled-coil type having a major and a minor coil, said machine comprising: a conveyor for carrying said cathode through a plurality of stations; means at one of said stations for filling the coils of said cathode with a suspension of electron-emitting material; blowing means at a second of said stations for removing said suspension from the inside of the major coil; means at a third station for spraying a quick-drying solvent on said cathode to concentrate said suspension within the minor coil; and a drying oven at a fourth station for substantially completely drying said suspension.

5. A machine for treating electric discharge lamp cathodes of the coiled-coil type having a major and a minor coil, said machine comprising: a conveyor for carrying said cathode through a plurality of stations; means at one of said stations for effecting a first filling of the coils of said cathode with a suspension of electron-emitting material; a first blowing means at a second of said stations for removing said suspension

from the inside of the major coil; a first spraying means at a third station for spraying a quick-drying solvent on said cathode to concentrate said suspension within the minor coil; a drying oven at a fourth station for substantially completely drying said suspension and solvent; means at a fifth station for effecting a second filling of the coils of said cathode with a suspension of electron-emitting material, a second blowing means at a sixth station for again removing the suspension from the inside of the major coil; a second spraying means at a station following said sixth station for again spraying a quick drying solvent on said cathode; and a final blowing means at a station following said second spraying station.

6. A machine for treating electric discharge lamp cathodes of the coiled-coil type having a major and a minor coil and mounted on a flare, said machine comprising: a conveyor for carrying said cathode through a plurality of stations; a flare mounting plate on said conveyor, said plate being formed with a plurality of levels for mounting flares of different sizes; means at one of said stations for filling the coils of said cathode with a suspension of electron-emitting material; blowing means at a second of said stations for removing said suspension from the inside of the major coil; and means at a third station for spraying a quick-drying solvent on said cathode to concentrate said suspension within the minor coil.

7. The combination of claim 2, in which the rotatable wheel extends in part into a container for a suspension of electron-emitting material.

8. The combination of claim 2, in which the rotatable wheel extends in part into a container for a suspension of electron-emitting material, and a reservoir for supplying liquid to said container.

9. The combination of claim 2, and a reservoir for supplying said atomizer.

10. The combination of claim 2, in which the rotatable wheel has its axis of rotation transverse to the path of the cathode through said station.

11. A machine for treating a cathode, with a suspension of an electron emissive material, said machine comprising: a conveyor movable through a definite path; means for suspending a cathode from said conveyor, said suspending means being so mounted on said conveyor as to carry a cathode suspended thereby through a definite path in accordance with the movement of said conveyor; means for disposing a quantity of said suspension in the path of said cathode; means for blowing transversely through the path of said cathode to remove excess suspension from said cathode; and a spraying device disposed to spray a quantity of a quick drying solvent transversely through the path of said cathode.

CHARLES L. ALBRIGHT.