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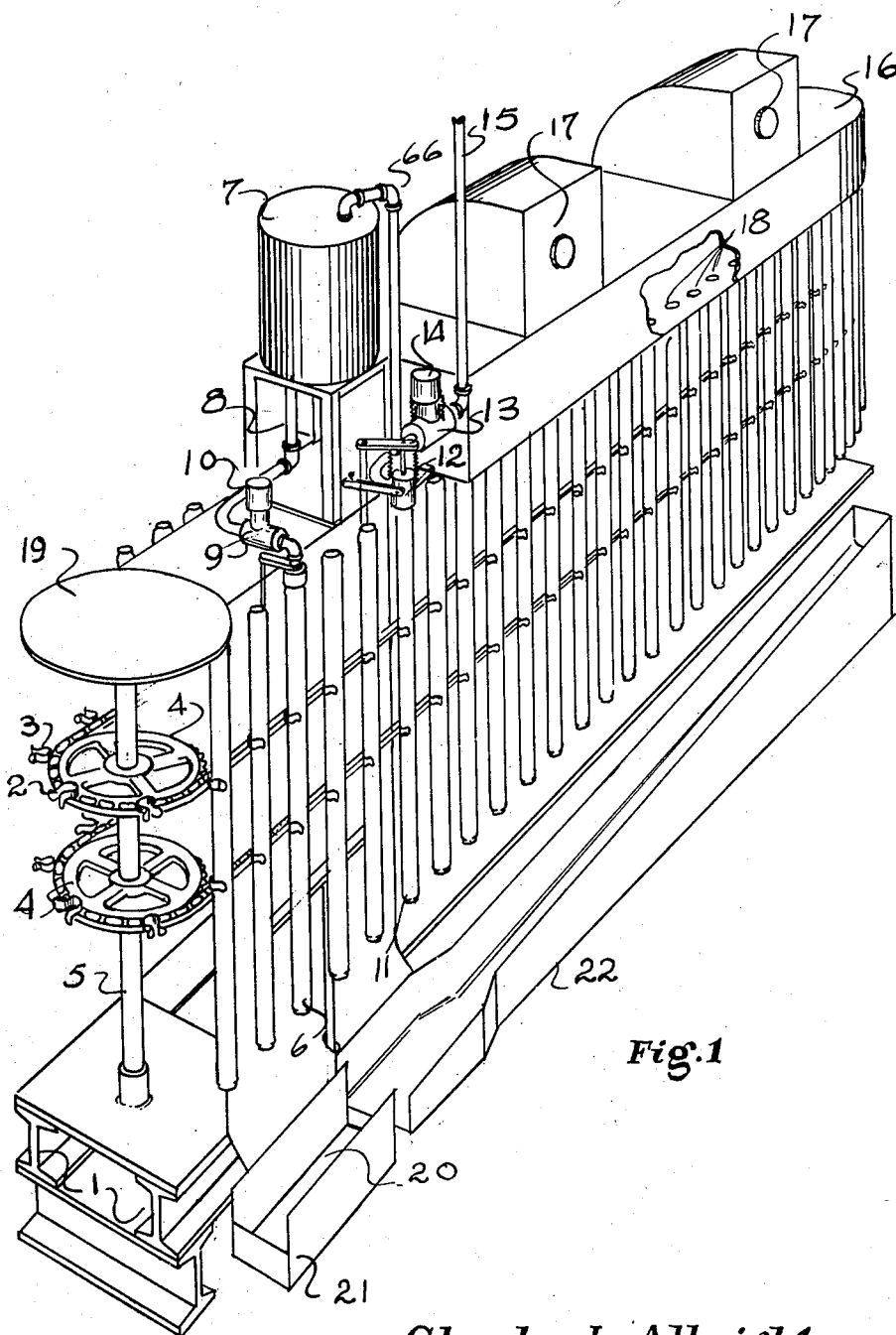
C. L. ALBRIGHT

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APPARATUS FOR COATING FLUORESCENT LAMPS

Filed Sept. 4, 1941

2 Sheets-Sheet 1



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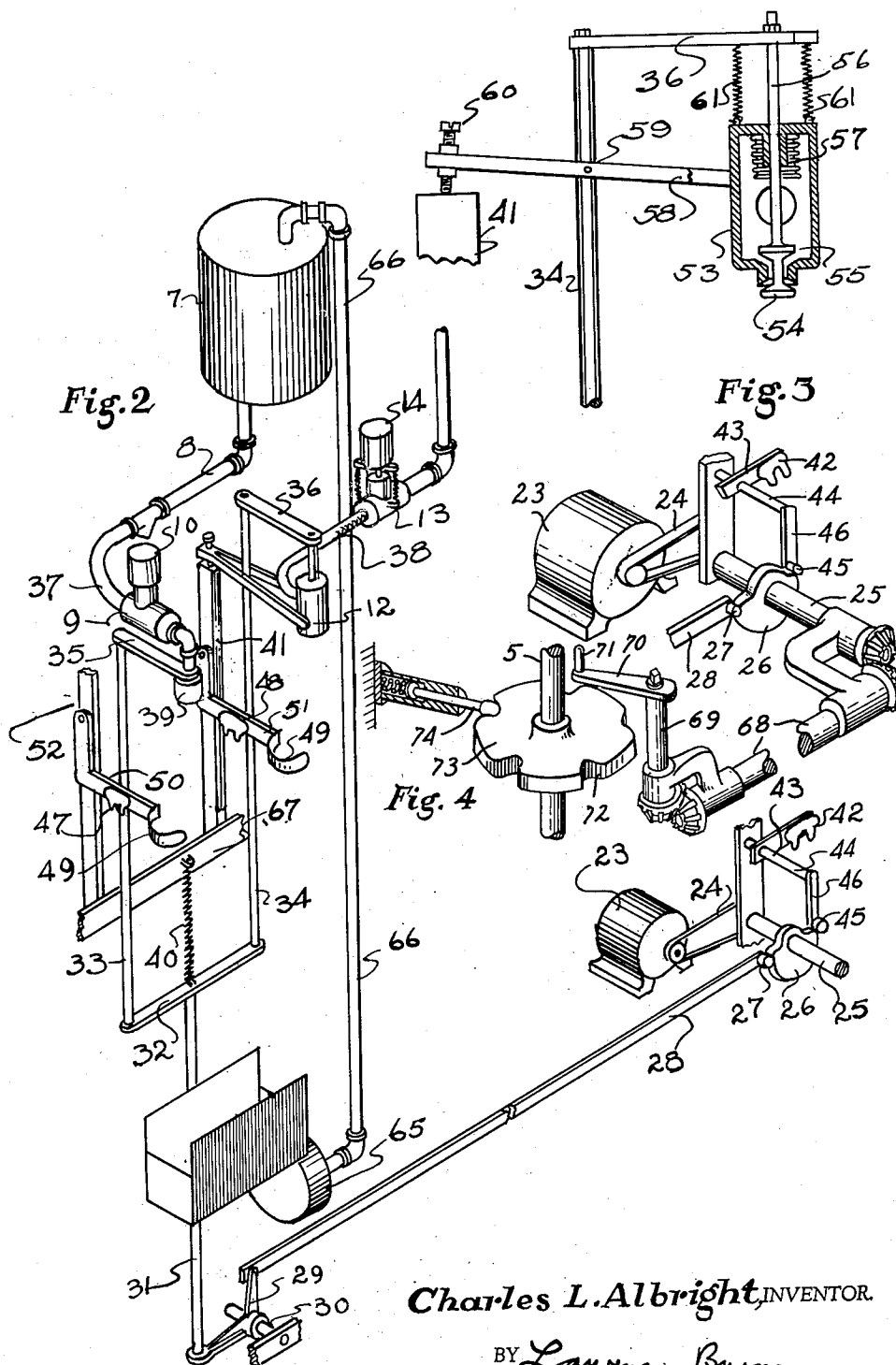
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UNITED STATES PATENT OFFICE

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APPARATUS FOR COATING FLUORESCENT LAMPS

Charles L. Albright, Beverly, Mass., assignor to
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Application September 4, 1941, Serial No. 409,496

4 Claims. (Cl. 91-13)

This invention relates to fluorescent lamps and more particularly to apparatus for the coating thereof.

An object of this invention is to provide an apparatus for coating elongated tubular bulbs with a luminescent solution.

Another object is to provide an apparatus which will lend itself to high speed production methods.

A further object is to include in such an apparatus means for washing said bulbs before the application of the luminescent solution.

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

Figure 1 is a perspective view of the bulb coating apparatus.

Figure 2 is a diagrammatic perspective view of the actuating mechanism.

Figure 3 is a detail of the nozzle assembly.

Figure 4 is a diagrammatic perspective view of the indexing means.

In the manufacture of fluorescent lamps a coating of luminescent material is applied to the inner walls of the elongated bulb and is then dried before the coated bulb is baked. Before the coating is applied it is desirable to insure the cleanliness of the walls of the bulb by flushing it.

As shown in Figure 1, the apparatus of this invention consists of an elongated conveyor mounted on the I beam iron supports 1. This conveyor consists of a pair of endless chains 2 with the plurality of clips 3 attached thereto. These chains move about the sprocket wheels 4 which are driven by the drive shaft 5. Mechanism for indexing the drive shaft 5 is shown in Figure 4. Shaft 5 is intermittently partially rotated through the action of constantly rotating shafts 25, 68 and 69, driven by motor 23 through bevel gear connections. Shaft 69 carries an index arm 70 and index pin 71. Pin 71 engages peripheral recesses 72, in index wheel 73 fixed on shaft 5. Shaft 5 is held in indexed position by spring finger 74 which engages recesses 72. The bulbs are loaded on the apparatus being positioned with respect to height with the disc 19 atop the shaft 5 as a guide, sprayed with a cleaning solution, coated with a luminescent solution and passed through a series of drying steps.

The bulb 6 is shown at the station at which the bulbs are washed with a quantity of the solvent used in preparing the vehicle for the suspension of the luminescent material. Thus, for example, if butyl acetate were the solvent used

as is the case here, the bulbs would be washed with butyl acetate. The butyl acetate flows from the reservoir 7 through the line 8 into the bulb. This flow is controlled by the valve 9 actuated by the solenoid 10.

Two or three stations are permitted to intervene between the bulb washing and the bulb coating positions in order that the excess butyl acetate may drain off and that remaining on the walls of the bulb may dry. At the station at which the bulb 11 is located, the bulb is coated with a solution of luminescent material. The flow of coating solution from the nozzle 12 is controlled by the valve 13 which is actuated by the solenoid 14. The coating solution reservoir is not shown but may be located above the apparatus similar to the bulb washing reservoir and connected to the line 15.

The remainder of the cycle is devoted to drying the bulb. This is accomplished by causing the bulbs to pass directly beneath an elongated drying chamber which consists of a chamber 16 having a pair of fans 17 mounted on the top thereof to draw in the air and a plurality of holes 18 in the bottom thereof, so located that the bulbs will be in register therewith at the several drying stations. The chamber 16 is partly in section to show holes 18.

The excess butyl acetate which drains from the bulbs as they are washed passes through the filter 20 in the recovery reservoir 21 and is pumped from there back up into the reservoir 7 through the pump 65 shown in Figure 2 and the connecting line 66. The excess coating solution which drains from the bulbs runs down the inclined trough 22 and may be collected and reclaimed therefrom.

Figure 2 shows the mechanism which actuates the washing and coating nozzles. The motor 23 through the belt 24 drives the cam shaft 25 with the cam 26 thereon. The cam follower 27 on the arm 28, following the contour of the cam 26 provides the means through which the washing nozzle and the coating nozzle are brought down to the top of each bulb after the machine has indexed to the washing and coating stations and are withdrawn therefrom to permit the indexing of the machine.

Movement of the arm 28 to the left is transmitted through the rocker 29, pivoting about the shaft 30, into the downward movement of the shaft 31. The cross bar 32 is mounted atop the shaft 31 and the shafts 33 and 34 project upwardly from the ends thereof. The arm 35 is mounted

atop the shaft 33 and the arm 36 is mounted atop the shaft 34.

The lines 37 and 38 are flexible thereby permitting the valve and nozzle washing assembly on the one hand and the coating nozzle assembly on the other hand to be moved downwardly by the downward movement of the shafts 33 and 34 transmitted thereto through the arms 35 and 36 respectively. It is in this down position that the washing nozzle 39 and the spraying nozzle 12 are located in washing and spraying relationship respectively with the bulbs.

The spring 40 suspended between the fixed support 67 and the cross bar 32 serves as the means through which the upward movement of the washing and coating nozzles is assured in order to permit the indexing of the machine. When the shaft moves downwardly, the cross bar 32 also moves but the support 67 remains fixed thereby causing the spring to expand. The expanded spring will exert a tension sufficient to accomplish the withdrawal of the nozzles 39 and 12 as soon as the contour of the cam 26 so permits. A firm positive cam contact at all times is thereby assured.

As was pointed out in the description of Figure 1, the valves 9 and 13 are energized by the solenoids 10 and 14 respectively. The circuit through these solenoids is normally open and is closed only when their respective nozzles have dropped down to perform the washing and coating operations respectively. These intermittent periods of actuation are controlled primarily by the mercury switch 42 adjacent the cam operating assembly. The switch 42 is mounted on the arm 43 which is fixed to the shaft 44. The movement of this shaft 44 is governed by the contour of the cam 26 through the cam follower 45 on the connecting link 46. Thus when the cam operating mechanism causes the nozzles 39 and 12 to move into operating relationship to the bulbs, it at the same time closes the circuit through the mercury switch 42 to thereby energize the solenoids 10 and 14 respectively.

There is however a safety check on the actuation of the solenoids in order to prevent their energization when there is no bulb at the washing or at the coating station. The mercury switch 42 is connected to the solenoids 10 and 14 through mercury switches 47 and 48 respectively. The circuit through these switches is normally open and is closed when a bulb moving from the station immediately preceding the nozzle 39 in one case and the nozzle 12 in the other strikes against the resilient clip 49 on the outer end of the rocker arm 50 in the case of the switch 47 and the rocker arm 51 in the case of the switch 48. These arms 50 and 51 are pivotally mounted on the supports 52 and 41 respectively. When a bulb strikes the resilient clips 49 it will push the clips back and cause the rocker arms 50 and 51 on which the switches 47 and 48 respectively are mounted to swing sufficiently about their respective pivots to close the circuit therethrough and thus energize the solenoids 10 and 14. Thus in cases where no bulb is present the circuit through the switch 47 or the switch 48 or both, will remain open and the solenoids 10 and/or 14 will not be energized. The wiring connection between these switches and the solenoids has been omitted in order to more clearly illustrate the apparatus.

Figure 3 shows the coating nozzle assembly. The bulb washing nozzle has not been more completely illustrated for the reason that since it is

not necessary to take the degree of care and accuracy in washing as it is in coating, any suitable regular nozzle may be used for washing.

The bulb coating nozzle 12 consists of the cylindrical chamber 53 into which the coating solution flows from the line 38, the solution deflector plug 54 and the plug 55 on the rod 56 and the metallic bellows 57 concentric with the rod 56 and within the chamber 53 at a point where the rod 56 passes therethrough. The rod 56 is fixed to the arm 36 which is in turn fixed to the top of the shaft 34. The arm 58 pivots on the stud 59 projecting from the shaft 34 and has the cylindrical chamber 53 fixed to one end and the adjustable screw 60 located at the other end.

Since the rod 56 is fixed to the arm 36 which is in turn fixed to the shaft 34, the rod 56 will drop down the same distance as shaft 34. However, the cylindrical chamber 53 will drop down slightly further. By adjusting the screw 60, the chamber 53 will drop with the shaft 34 and the rod 56 until the screw 60 strikes the support 41. The chamber 53 will then move down with the rod 56 and further than the rod 56 so that the floor of the chamber 53 will disengage itself with the plug 55 which normally seals the floor of the chamber to prevent the flow of coating solution therefrom. The screw 60 is adjusted so that not only will the plug 55 be drawn up enough to permit passage of the coating solution but also the solution deflector plug 54 will be drawn up sufficiently close to the bottom of the cylindrical container 53 to deflect the coating solution onto the walls of the bulb at the desired angle.

The tension on the spring 61, created by the cylindrical chamber 53 moving downwardly further than the arm 36, is sufficient to draw the chamber 53 back up to its normal position with the plug 55 sealing the floor thereof after the coating operation has been completed and the coating nozzle assembly has withdrawn itself to permit the indexing of the machine to move the bulbs to the next station.

What I claim is:

1. Apparatus for coating elongated bulbs with a solution of luminescent material, said apparatus comprising: means for supporting said bulbs in a vertical position; a carrier for said means movable through a series of indexing steps; a plurality of stations to which said carrier indexes; a washing nozzle having its operative position above and substantially in register, with an end of one of said bulbs at one of said stations; and a nozzle for coating solution having its operative position above and substantially in register, with an end of one of said bulbs at another of said stations.

2. Apparatus for coating elongated bulbs with a solution of luminescent material, said apparatus comprising: means for supporting said bulbs in a vertical position; a carrier for said means movable through a series of indexing steps; a plurality of stations to which said carrier indexes; a washing nozzle having its operative position above and substantially in register, with an end of one of said bulbs at one of said stations; a nozzle for coating solution having its operative position above and substantially in register, with an end of one of said bulbs at another of said stations; and means for moving said washing and coating solution nozzles into washing and coating relationship respectively with said bulbs.

3. Apparatus for coating elongated bulbs with a solution of luminescent material, said appara-

tus comprising: means for supporting said bulbs in a vertical position; a carrier for said means movable through a series of indexing steps; a plurality of stations to which said carrier indexes; a washing nozzle having its operative position above and substantially in register, with an end of one of said bulbs at one of said stations; a nozzle for coating solution having its operative position above and substantially in register, with an end of one of said bulbs at another of said stations; valving means for said washing nozzle; valving means for said coating nozzle; and electrical means for actuating both of said valving means.

4. Apparatus for coating elongated bulbs with a solution of luminescent material, said apparatus comprising: means for supporting said bulbs in a vertical position; a carrier for said means movable through a series of indexing steps; a

plurality of stations to which said carrier indexes; a washing nozzle having its operative position above and substantially in register, with an end of one of said bulbs at one of said stations; 5 a nozzle for coating solution having its operative position above and substantially in register, with an end of one of said bulbs at another of said stations; valving means for said washing nozzle; valving means for said coating nozzle; electrical 10 means for actuating both of said valving means; automatic means for preventing the electrical actuation of said washing nozzle valving means when a bulb is not in register with said washing nozzle; and automatic means for preventing the 15 electrical actuation of said coating nozzle valving means when a bulb is not in register with said coating nozzle.

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