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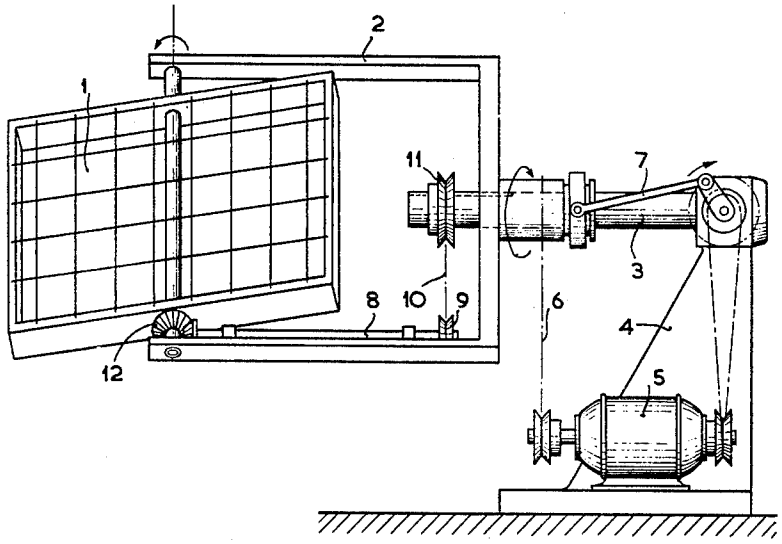

INVENTOR
CURT E. NYMAN

BY Francis R. Sinfani
AGENT

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METHOD FOR COATING THE INNER WALL OF A TUBE INTENDED FOR ELECTRIC DISCHARGE LAMPS WITH A UNIFORM LIQUID LAYER AS WELL AS AN ARRANGEMENT FOR THE APPLICATION OF THE METHOD

Curt Elof Nyman, Trollbacken, Sweden, assignor to North American Philips Company, Inc., New York, N.Y., a corporation of Delaware

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The present invention relates to a method for coating the inner wall of a tube intended for electric discharge lamps with a uniform layer of liquid as well as an arrangement for the application of the method.

In electric discharge lamps, as a rule, the inner wall of the tube-shaped lamp envelope must be provided with a coating of a luminescent substance which transforms the radiation delivered by the discharge into a radiation with longer wave length, i.e. visible light.

In order to get a glowing lamp to send out light with constant intensity from different locations on the tube, it is necessary that the thickness of the coating be absolutely uniform. In straight tubes such a coating can be achieved without difficulties, but for such curved tubes as are used for advertising illumination and similar purposes, special measures must be taken and many different methods have been suggested.

One of these methods aims to initially provide the inside with a thin adhesive layer in liquid form, e.g. phosphorus acid, by enclosing in the tube small glass pearls and shaking the same, which by immersion are provided with a layer of liquid and then, after the pearls have been removed, introducing the luminescent substance in the form of a fine powder, which is brought to adhere to the adhesive layer.

In this way one achieves a very uniform distribution of the adhesive layer, which is a condition for the luminescent substance to become uniformly distributed, but the shaking has necessarily been executed manually, which requires great dexterity of the person executing the shaking. Besides breakage occurs relatively often, which is serious with respect to the fact that the tubes already are in their final and often complicated form.

The aim of the present invention is to make possible the application of the mentioned method without the disadvantage hitherto connected with the method.

This is obtained, according to the invention, in such a way that the tube, when filled with the glass pearls, by a shaking device is given a to and fro going motion under simultaneous turning around two mutually right-angled axes, the best result being obtained when the ratio between the angle velocities of the two turning motions are chosen so that it differs somewhat from one.

A coating provided in this way has by testing proved to have at least as good a uniformity as a coating made by manual shaking by a dextrous worker. The breakage percentage is besides considerably lower, especially when coating a series of the same tubes since the stress exerted on each tube may be exactly adjusted from case to case by adjusting the frequency and the amplitude of the to and fro motion.

At the application of the method according to the invention a shaking device is used having a holder serving for the fastening of the tube on the device, which holder is turnable mounted on a to and fro displaceable and simultaneously turnable arranged frame part with a turning axis, which is right-angled to the turning axis of the holder. The turning of the holder relative the frame part is achieved by transmission of the turning movement

which takes place at the turning of the frame part by a wheel eccentrically arranged on the frame part, which wheel co-operates with a non-turnable wheel provided on the turning axis of the frame part.

The device is more closely explained in the following with reference to the annexed drawing, which shows an embodiment chosen as example of a shaking device according to the invention.

The holder, on which the tube is fastened is designated 1 and consists of a rectangular frame, which is turnably mounted between the branches of a fork-shaped frame part 2. This one on its side is mounted turntable and displaceable on a shaft 3 on a stationary frame part 4. The frame part 2 is brought to rotate by an electric motor 5 by means of an endless belt 6 and simultaneously brought to move to and fro by means of the crank mechanism 7 driven by a motor over a second endless belt, and provided on the frame part 4. Upon the rotation of the frame part 2 around the shaft 3, also the shaft 8 provided on the frame part 2 is rotated by means of a wheel 9 arranged on it, an endless belt 10 and a wheel 11 fixedly arranged on the shaft 3, the turning of the shaft 8 being transmitted to the holder 1 by means of a bevel gear drive 12. In order to achieve a careful shaking, the transmission 8—12 is so adjusted that the rotation speed of the frame part 2 exceeds somewhat above that of the holder 1, e.g. about 10%, which value may be varied of course and also may be negative.

The embodiment shown is of course only to be considered as an example of the application of the invention and different modifications are possible within the scope of the invention. Thus e.g. the transmission 9—11 may consist of a toothed wheel gearing, the shaft 3 suitably being provided with a key-groove or such like so that the wheel 11 without turning may be displaced on the shaft 3 of the frame part 2.

What is claimed is:

1. A method of coating the interior of an irregularly shaped tubular object comprising confining a plurality of coated glass beads within said object, rotating said object about two mutually perpendicular axes while simultaneously reciprocating said object in the plane of one of said axes, and maintaining the ratio of rotational velocities about said mutually perpendicular axes unequal to unity.

2. A method of coating the interior of an irregularly shaped tubular object comprising confining a plurality of coated glass beads within said object, rotating said object about two mutually perpendicular axes and simultaneously reciprocating said object in the plane of one of said axes whereby the coating material on said beads is transferred to the interior of said object.

3. Apparatus useful in coating the interior surfaces of hollow objects comprising a frame member, means for rotating said frame member, an object holder rotatably mounted upon said frame member substantially perpendicular to the axis of rotation thereof, means for rotating said object holder driven by said means for rotating said frame member, means for reciprocating said frame member and a single power means driving said means to rotate and reciprocate said frame member.

4. Apparatus useful in coating the interior surface of hollow objects comprising an irregularly shaped tubular object, a frame member, means for rotating said frame member, means supporting said object rotatably mounted upon said frame member substantially perpendicular to the axis of rotation of said frame, means for rotating the means supporting said object driven by said means for rotating said frame member, the ratio of rotational velocity of said frame member and said object supporting means being unequal to unity, means for reciprocating

said frame member and power means for driving said means to rotate and reciprocate said frame member.

5. Apparatus according to claim 4 wherein said means for rotating and reciprocating said frame member comprises a shaft connected to said frame, a sleeve slidable longitudinally on said shaft also connected to said frame and crank means operatively associated with said sleeve to impart reciprocal movement thereto.

References Cited in the file of this patent

UNITED STATES PATENTS

1,271	Banta	Aug. 3, 1839
1,292,127	Stevens	Jan. 21, 1919
2,146,285	Corbett	Feb. 7, 1939
2,446,476	Huebner	Aug. 3, 1948
2,770,557	Atti	Nov. 13, 1956
2,827,391	Van Der Wolf et al.	Mar. 18, 1958
2,880,118	Taylor	Mar. 31, 1959