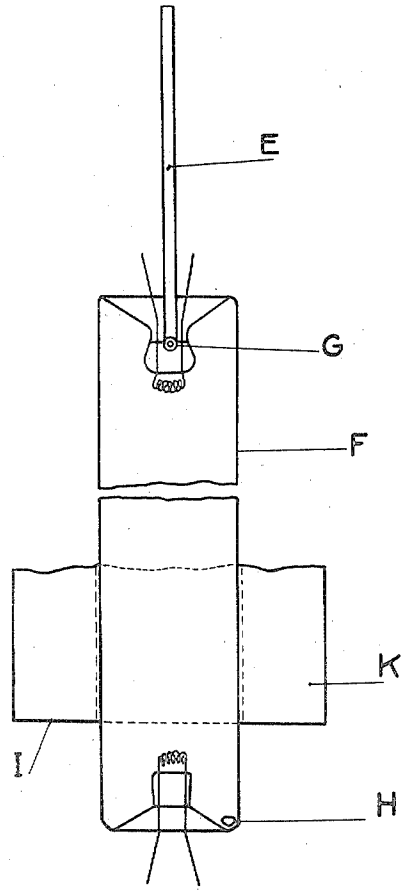
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MANUFACTURE OF MERCURY-CONTAINING, GAS FILLED ELECTRIC DISCHARGE APPARATUS

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MANUFACTURE OF MERCURY-CONTAINING, GAS-FILLED ELECTRIC DISCHARGE APPARATUS

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1 Claim. (Cl. 316—21)

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The present invention relates to improvements in the manufacture of electric discharge apparatus with a gaseous atmosphere containing mercury, such as, for example, lighting tubes the inner wall of which is coated with a luminescent material. It is known that this manufacture comprises in particular the step usually known as "exhausting" and consisting in heating the whole of the apparatus and especially some of its elements, and at the same time in removing the gases by a vacuum pump, with or without the passage of the electric discharge through the apparatus. If the desired quantity of mercury is introduced into the discharge apparatus before exhausting, this mercury, participating in the thermal treatment when the apparatus passes through the heating oven, can, by its vaporization, be detrimental to the thermo-emissive quality of the electrodes of the apparatus or give rise to the formation of blackish deposits on the walls, or affect the luminescent materials covering these walls when the apparatus contains such materials. It is with a view to remedy these drawbacks that, in practice, in particular for apparatus with electrodes sensitive to mercury and coated with luminescent substances, exhausting is effected in the absence of mercury, said mercury being introduced into the apparatus only after exhaustion, but this necessitates the introduction of the mercury under vacuum and, for this purpose, in addition to the vacuum pump, a pump is used for delivering into the tube the desired quantity of mercury; the apparatus realized with this pump must operate under vacuum, thus rendering its construction relatively complicated and difficult; moreover, the delivery pump comprises movable mechanical parts and, if it is necessary to lubricate them, there is a risk of the mercury being soiled.

The present invention overcomes these drawbacks in particular and does away with the use of the delivery pump; it essentially consists, when introducing the mercury into the apparatus itself prior to exhausting, in lodging the mercury in the end portion of the apparatus itself, then during the exhausting operation, in maintaining this portion at a lower temperature than those of the remainder of the apparatus, for example by allowing this portion to remain in contact with the ambient air. An additional cooling device may, if desired, be used. This end portion, which is nevertheless heated during exhaustion, thus constitutes a cold wall relatively to the remainder of the apparatus and, according to the well known principle of the cold wall, the mercury has no tendency to vaporize, said cold wall condensing the mercury vapour that might be produced.

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Therefore, in the case, for example, of an electric discharge tube provided with an electrode at each of its ends and with an exhaust tube at one of its ends only, for exhausting the discharge tube, the required amount of pure mercury is introduced through this exhaust tube whilst the discharge tube is held vertically with its exhaust tube at the top end; the exhaust tube has a sufficiently large diameter to enable the liquid to pass easily and, as this exhaust tube and the discharge tube are both at the ambient temperature, therefore are relatively cool, the mercury does not wet the glass and, also owing to this fact, it flows easily; it collects in the form of one or several drops in the lowermost part of the tube, therefore below the electrode nearest to said part. Thereafter, the discharge tube, still in the vertical position and with its mercury drop at the lower part thereof, is mounted on the usual pumping apparatus by means of its exhaust tube, when said apparatus is provided for such mounting with a connecting pipe under the vacuum piping; on the contrary, the discharge tube must be turned over and the mercury must be collected at the lower part thereof outside the heating stove or oven in case the vacuum piping is situated under the discharge tube.

Afterwards, during the pumping operations, vaporization of the mercury is avoided by disposing the discharge tube in such a way that its lowermost part, which contains the mercury, is not substantially heated, for example by allowing its lower portion to stand outside the oven and in the ambient air. During heating, a circulation of this ambient air obtains in practice around this lower tube part in order to maintain the latter at substantially ambient temperature. The time of heating, that is, the time during which the tube remains in the oven, is generally short, especially when the pumping operations are carried out on a rotary mechanical frame. The pumping operations are then continued and, as soon as the final vacuum in the tube is reached, the desired gaseous atmosphere is introduced, then the exhaust tube is sealed off and severed. Of course, this manner of operation is only given by way of example. For instance, the discharge tube can be provided with an exhaust tube at each end, which avoids the necessity of turning over the discharge tube, in the case indicated above, before its mounting on the pumping apparatus; the upper exhaust tube, which has not

been used for pumping, is sealed off after introduction of the mercury. In practice, it is always possible to suitably regulate the vertical distance between the level of the lower portion of the oven and the level where the drop of mercury is lodged, as well as the period of heating in the oven and the temperature thereof, so that a sufficient removal, by heat, of the gases from the lower part of the discharge apparatus is conciliated with the protection of the mercury against a detrimental temperature rise.

One of the advantages of the invention resides in that, as has been ascertained, in the case of tubes provided with an internal luminescent coating, it avoids the formation, at the end of a certain period of working, of spots on the wall, manifesting themselves when, the mercury being introduced before exhausting, the whole of the apparatus, including the mercury, is subjected to heating during exhaustion.

According to the accompanying figure, the mercury from the measuring device utilized for measuring an invariable minute quantity of liquid is introduced through the exhaust tube E into the discharge tube F. The liquid, after passing through the end opening G, penetrates into the discharge tube F in which the whole of it falls by gravity and gathers at H in the form of a drop or of several droplets. During the exhausting operation, the oven K surrounding the discharge tube, with slight play, must not have its lower portion reach the level of the drop H; the said

lower portion is situated for example at I, above the level of the electrode, which is further heated by Joule effect. The removal of the gases from this end portion of the tube appears, in practice, to be satisfactorily ensured.

What I claim is:

The process of manufacturing an electric discharge apparatus provided with electrodes and with a gaseous atmosphere containing mercury which comprises, introducing the mercury in the liquid state from the outside into one extremity of the envelope proper of the discharge apparatus, then placing the entire discharge apparatus in a heating oven while leaving said extremity outside the oven, and thereafter seasoning the tube.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,826,383	Smalley	Oct. 6, 1931
2,013,415	Marden et al.	Sept. 3, 1935
2,391,573	Herzog	Dec. 25, 1945

FOREIGN PATENTS

Number	Country	Date
461,454	Great Britain	Feb. 17, 1937