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# PATENT SPECIFICATION

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COMPLETE SPECIFICATION.



## Electric Discharge Lamp, especially Adapted for Advertising and Signalling purposes.

I, SAJWELL DOBRUSSKIN, of 20, Hochstrasse, Berlin, N., Germany, of no nationality, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to a negative or cathode glow discharge lamp with cold electrodes and having a filling consisting mainly of neon, or other rare gas.

By means of the improved lamp, constructed according to the present invention, hereinafter described, it is possible to achieve with a very low current consumption, very effective and striking effects which will attract the eye and which are suitable for advertising and signalling purposes, and this is more especially so because it is possible to increase considerably and to modify said effects by arranging lamps constructed as hereinafter described in suitable reflectors, such for instance, in hollow mirror reflectors the surfaces of which may be smooth, provided with suitable projections, grooves or the like, or which reflectors may be provided with a broken surface.

According to the invention a negative or cathode glow discharge lamp with cold electrodes and having a filling consisting mainly of neon or other rare gas is provided wherein the electrodes are mounted symmetrically about the axis of the glowing layer and are spaced apart at a small and uniform distance with thin solid insulation between them, the electrode connections being disposed as near as possible to the axis of the glowing layer, said electrodes having surfaces without angularities, the discharge moving with a circular or oscillating rotary motion over the external surface of one or both electrodes.

The accompanying drawing illustrates several embodiments of a lamp constructed according to the present invention wherein

Fig. 1 illustrates in longitudinal section a neon lamp constructed according to the present invention.

Fig. 2 is a transverse section thereof

[Price 1/-]

taken on the line A—B of Fig. 1.

Fig. 3 is a perspective view of part of the special design of the electrodes and

Figs. 4 and 5 are part sections through two designs of electrodes which vary from Fig. 1.

In the construction shown in Fig. 1 the tube *b* is fused at its lower extremity into the bulb *a* which may be of clear, frosted or coloured glass and said tube *b* contains a small glass tube *c* through which the current supply wire *d* passes.

The current supply wire *d* is connected at its lower extremity to the middle or centre contact *f* of the lamp whilst said wire *d* is connected at its top end to a small metal rod *d*<sub>1</sub> which is fused into the head *b*<sub>1</sub> of the glass tube *b* and is threaded at its top extremity and carries a bell shaped electrode *m*, which may, for instance be constructed of iron having a polished, and if required, an oxidised surface, or which may be constructed of highly polished aluminium or the like. Said electrode *m* is so mounted on the thread of said rod *d*<sub>1</sub> that it can be adjusted and fixed between two small threaded washers or discs *d*<sub>2</sub>.

*g* represents another current supply wire one extremity of which is connected to the screw socket *h* of the lamp and runs outside the small glass tube *c* through the glass tube *b* and is in the finished assembled arrangement of the electrodes within the bell shaped electrode *m* and is carried through the tube *b* at *b*<sub>2</sub> to the outside thereof as may be very clearly seen in Figs. 1 and 3; said current supply wire *g* is at its end then soldered or welded onto a tongue or lug *o*<sub>1</sub> stamped out of the disc shaped sheet metal electrode *o* and bent upwards. The excision *q*, formed by reason of the stamping out and bending of said contact tongue or lug *o*<sub>1</sub> enables the disc electrode *o* to be mounted on the glass tube *b* and allows it to pass over the pip *b*<sub>2</sub>.

The disc electrode *o* fits on and rests on an enlargement or annular projection *b*<sub>a</sub> provided on the glass tube *b* two insulating washers *r*<sub>1</sub> *r*<sub>2</sub> preferably of mica being interposed and said disc electrode is electrically insulated from the

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bell shaped electrode  $m$  by means of a washer  $p$  of insulating material preferably also made of mica and the edge of said washer  $p$  projects beyond the bell shaped electrode  $m$ .

For the purpose of facilitating the pushing on or placing in position of the insulating washers  $p$  and  $r_1, r_2$  they are provided with internal excisions which allow the pip  $b_2$  of the glass tube  $b$  to pass. For the purpose of safely covering all these excisions on the internal edge, and especially for the purpose of covering the excision  $q$  provided in the disc  $o$  and thus avoiding any breakdown of the desired working of the lamp and its neon discharge layer, the mica washers  $r_1, r_2$  are, or at least one of them is staggered in such manner in respect to one another and in relation to the excision  $q$  of the electrode  $o$  that their excisions on their inner edges  $s_1, s_2$  (Fig. 2) do not register with the excision  $q$  of the electrode.

In many cases it is desirable, or even necessary, for the purpose of the desired motion of the glowing layer, to interpolate a high resistance in front of the neon discharge lamp, or at least in front of one of the electrodes, and this high resistance may consist of one of the electrode supply leads in the interior of the lamp, or the said resistance may be interpolated in the supply lead  $g$  at  $i$ , for example, as shown in Fig. 1 in one or other of said supply leads.

The causes and physical phenomena underlying the movement of the glow are not yet known definitely but are obviously due to either electromagnetic, electrostatic or thermal forces, or are the effect of several of these forces. However, in order to produce a substantially regular, preferably rotational movement, the construction of the discharge path between the cathode and anode should be substantially symmetrical with regard to the virtual axis of rotation of the glowing layer. In order to obtain or ensure respectively the desired effect of a luminous rotary glow during the operation of the lamp, I have found it advantageous, besides the need for the distance between the electrodes being very small and uniform at all points as obtained by a structure as described, that the design of the parts as well as the pressure of the gas filling of a glow discharge lamp in combination with the prevailing operating current conditions should preferably be such that the luminous glowing layer produced around the dome or bell-shaped electrode  $m$ , which has a smooth surface, extends only up to the outer edge of the mica insulating spacing disc or washer  $p$

between the electrodes, but does by no means extend beyond the outside edge of the electrode  $o$ . In the case of the construction of the electrode according to Fig. 4 the disc electrode  $o$  is provided with an edge  $o_2$  bent upwards.

In the case of the construction of the electrodes according to Fig. 5 the bell shaped electrode  $m$  is provided with a small gutter like flange  $m_1$  at its edge and the edge  $o_2$  of the disc electrode  $o$  is bent upwards at a short distance from the edge of the flange  $m_1$  upwards around the mica washer  $p$ .

It is of course possible to vary the dimensions and constructional details of the embodiments described and to vary them from the arrangements and constructions shown without thereby exceeding the scope of the invention.

It is thus possible to give the electrodes also a different design; for instance, it may be possible to design or construct, for certain purposes both electrodes in the shape of circular discs or cups.

The usual rare gases, and in the case of lamps working off the main the usual gas pressure of the gases are used in lamps constructed according to the present invention.

The most usually used mixture of filling gas consists, for example of 80 parts neon and a total of 20 parts Helium and Argon. In place of the latter, however, or in conjunction therewith it is possible to use such rare gases as Krypton or Xenon, for instance.

The pressure of the gases in the bulb usually varies approximately between 10 and 15 mm. of the mercury column and most usually the said pressure varies between 10 and 12 mm. of the mercury column.

By reason of the construction and filling of the lamp hereinbefore described the settling of the layer of luminous discharge of gases, having a tendency to oscillate or gyrate, on the edges of the electrodes is effectively prevented.

Many constructions of negative or cathode glow lamps have previously been proposed. For instance, in one construction, a cylindrical cathode has been fitted firmly in a thick-walled anode with the interposition of thin solid insulation such as mica between said electrodes. In another construction, two rectangular metal plates serving as electrodes and separated by a sheet of glass have their electrode leads situated near the axis of the glass envelope, the longer axes of the electrodes lying centrally and in the longitudinal direction of the glass envelope. In all such prior lamps, as far as I am aware, there is produced no con-

tinuous regular or irregular oscillatory or rotary movement of the glow when such lamps are supplied from a steady voltage supply, as is the case in the present invention. 5

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim 10 is:—

1. A negative or cathode glow discharge lamp with cold electrodes having a filling consisting mainly of neon or other rare gas wherein the electrodes are mounted 15 symmetrically about the axis of the glowing layer and are spaced apart at a small and uniform distance with thin solid insulation interposed between them, the electrode connections being disposed as near as possible to the axis of the glowing 20 layer, said electrodes having surfaces without angularities, the discharge moving with a circular or oscillatory rotary motion over the external surface of one 25 or both electrodes of the lamp.

2. A negative or cathode glow discharge lamp as claimed in claim 1, characterised in that at least one washer 30 formed of mica or other insulating material is interposed between the electrodes.

3. A negative or cathode glow discharge lamp according to claim 2, characterised in that one of the two electrodes 35 projects beyond the outer edge of the other electrode by approximately the size of the thickness of the discharge glow when the lamp is working.

4. A negative or cathode glow discharge lamp, according to claims 2 and 3, characterised in that the supply leads to the electrodes are carried, insulated in respect to one another through a glass tube 40 (*b*) which serves preferably also as a carrier for the electrodes, and that the current supply to one of the two electrodes 45 (*o*) is laterally carried outside said tube and made gas tight and is connected to

said electrode as near as possible to the inner edge thereof. 50

5. A negative or cathode glow discharge lamp according to claim 4, characterised in that one (*o*) of the two electrodes is provided with an excision at its inner edge (*g*) the lug or tongue (*o<sub>1</sub>*) thus 55 formed serving as a contact lug for the supply lead (*g*).

6. A negative or cathode glow discharge lamp according to claims 2 to 5, characterised in that any excisions possibly present on the inner edge, for instance of one of the electrodes (*o*) and corresponding excisions of the interposed mica washers or the like (*r<sub>1</sub>*, *r<sub>2</sub>*) are 60 caused to overlap by turning these mica washers around in relation to one another and in respect of the excisions (*g*) on the edge of the electrode. 65

7. A negative or cathode glow discharge lamp according to claims 2 to 6, characterised in that at least one of the two electrodes is of a disc shape and may be if required provided with an upwardly bent ledge (*o<sub>2</sub>*) or with a ledge (*o<sub>3</sub>*) bent over at the level of the edge (*m<sub>1</sub>*). 70

8. A negative or cathode glow discharge lamp, according to claims 3 to 7, characterised in that one of the two electrodes (*m*) is of a bell like shape and encases when the electrode unit is mounted 80 the connection to the other electrode.

9. A negative or cathode glow discharge lamp, according to claims 2 to 8, characterised in that the electrodes consist of smooth metal for instance 85 polished aluminium.

10. The improved negative or cathode glow discharge lamp constructed, arranged and operating substantially as herein described and illustrated in the 90 accompanying drawings.

Dated this 7th day of April, 1932.

CHATWIN & COMPANY,  
253, Gray's Inn Road, London, W.C. 1.,  
Patent Agents for the Applicant.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

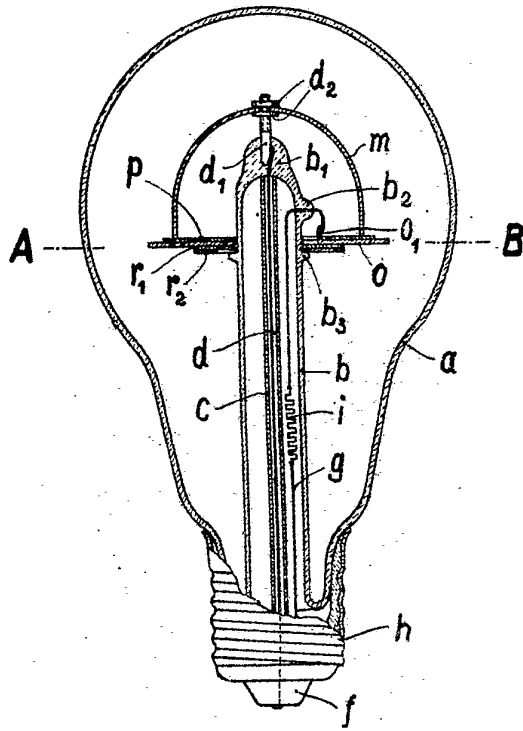


Fig. 3.

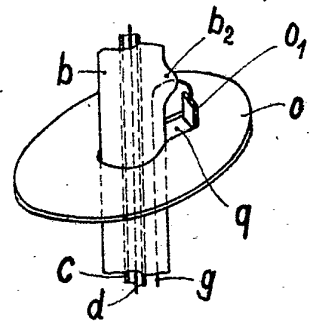


Fig. 4.

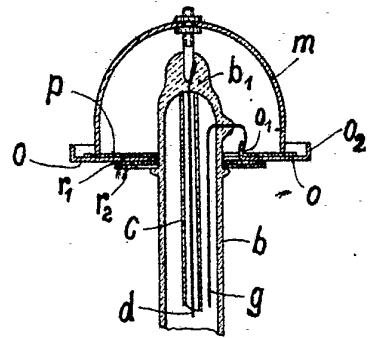


Fig. 2.

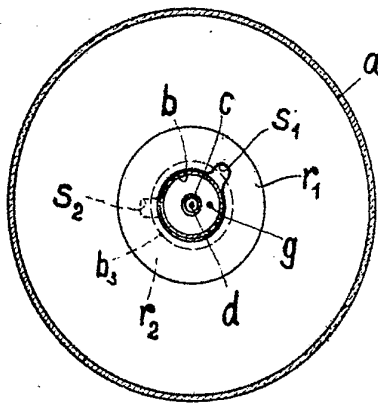


Fig. 5.

