

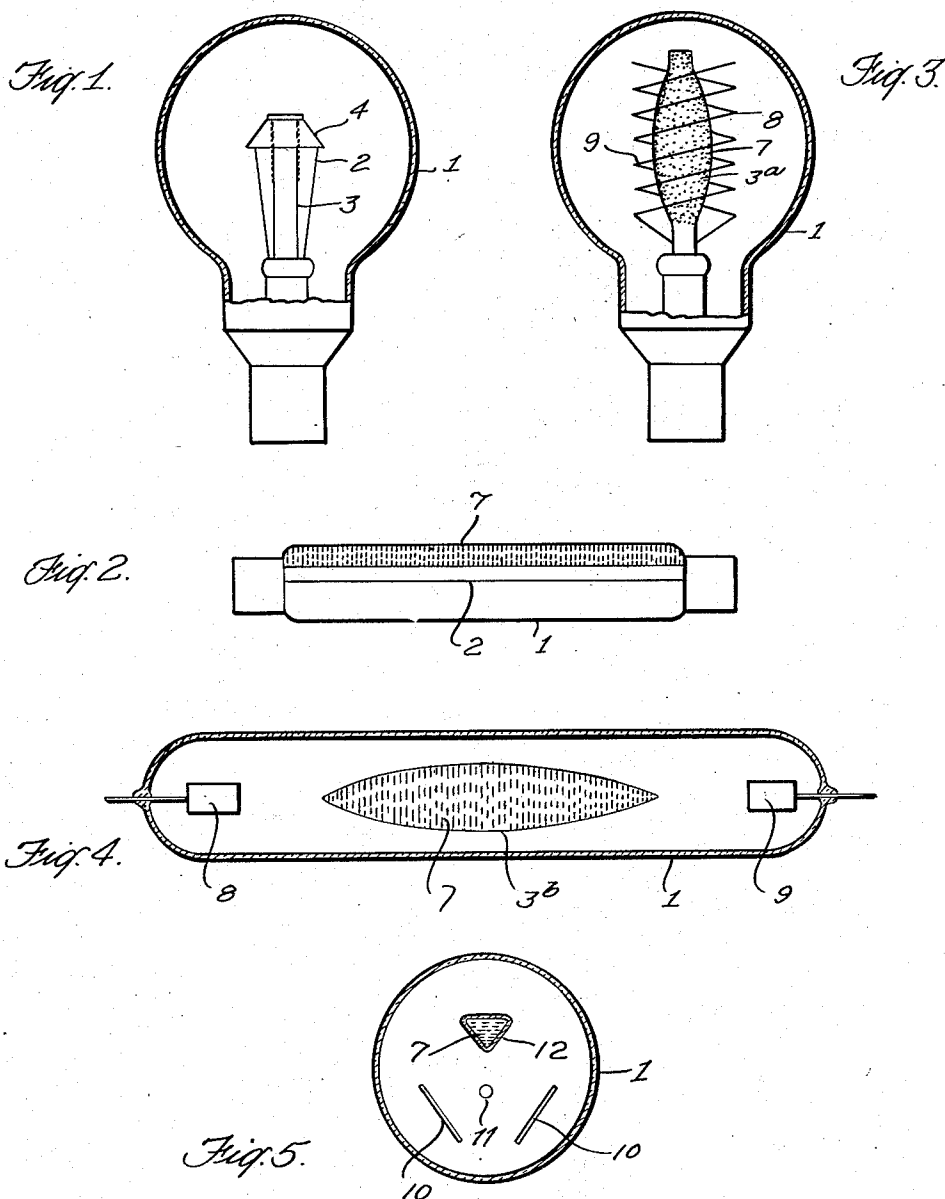
Dec. 17, 1940.

E. GERMER

2,225,495

ELECTRICAL DISCHARGE DEVICE

Filed Feb. 19, 1937



Edmund Germer
INVENTOR

BY *[Signature]*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,225,495

ELECTRICAL DISCHARGE DEVICE

Edmund Germer, Berlin-Wannsee, Germany

Application February 19, 1937, Serial No. 126,617
In Germany March 4, 1935

3 Claims. (Cl. 176-122)

This invention relates to light sources and particularly those in which light is produced at least in part by fluorescence.

It has been known prior to my invention to coat the walls of lamps with fluorescent materials, and also to include fluorescent substances in the material of which such lamp walls are made. Since, however, the fluorescent materials are in general light absorbing, the efficiency of the lamp is impaired by absorption even though it may at the same time be increased by the fluorescence.

Accordingly, it is one object of the present invention to avoid such loss due to absorption and to improve the efficiency of the lamp.

Another disadvantage of fluorescent lamps commonly experienced prior to my present invention is that the life of the lamp is ordinarily greater than that of the fluorescent materials, which are gradually deteriorated by the radiation to which they are subjected.

Another object of my invention is to avoid this limitation to the useful life of such lamps and to provide lamps in which the fluorescent layer can be repeatedly renewed automatically or by a simple treatment easily performed by any user.

In the accompanying drawing I have shown and I have described below a preferred embodiment of my invention and various modifications thereof. I have chosen these for purposes of explanation and to illustrate the principle of my invention and the best ways of embodying it for practical use. It is to be understood, however, that these are neither exhaustive nor limiting of the invention but on the contrary are intended to enable others skilled in the art to modify the invention and to embody it in innumerable forms each as may be best suited to particular requirements.

In the drawing:

Fig. 1 is a view in side elevation of an incandescent lamp embodying my invention;

Fig. 2 is a view in side elevation of a typical soffit or strip lamp;

Fig. 3 is a similar view of a cathode glow lamp embodying the invention.

Fig. 4 is a diagrammatic view showing a long column gaseous discharge lamp embodying the invention; and

Fig. 5 is a view in cross section of a two-anode rectifier type gaseous discharge lamp.

This invention starts from the idea of letting the primary light emission from the light source (incandescent filament, positive column, nega-

tive glow light, etc.) act directly and at the same time and furthermore of letting the additional secondary radiation also get to outside undiminished. This is attained by placing the fluorescent materials not in the path between the light source and the observer, but beyond the light source from the observer. Thus, it is attained that the direct light need not pass the fluorescence screen and also that the fluorescence light need not penetrate the whole layer after it has been generated on the surface whereby it would be weakened considerably. Therefore, the fluorescent materials are so applied on the inside of the lamp that their surface, on which the radiation to be transformed is thrown, is exposed.

Fig. 1 shows the case of a pear-shaped incandescent lamp. The reference numeral 1 indicates the glass body of the lamp, 2 the incandescent filament and 3 the supporting post for the filament. If necessary, the latter is spread laterally at its upper end, and also the thin supporting wires 4 are bent somewhat downwards so that the filament 2 may be brought near the supporting post 3. The supporting arm is provided on the surface or inside, wherefor it may be hollow, with fluorescent materials. The latter may be applied firmly to the surface, may be incorporated into the glass or may be loose, e. g., in the form of powder in the hollow stem 3. Naturally, instead of the stem 3 also some other part may serve as the support for the fluorescent materials.

If one selects as fluorescent materials those which transform the ultra-violet radiation of the incandescent filament into visible preponderantly bluish radiation, one obtains an incandescent lamp with daylight-like radiation. The secondary radiation will be particularly large in this and in the other cases, if one extends the surface of the fluorescent carrier (e. g., by grooving, corrugating, waffling, or the like).

This expedient also reduces the density of the fluorescent material required in a lamp of given dimensions, and may be even more significant when used on a wall through which the visible light is required to pass.

In Fig. 2, one example of a soffit lamp is presented. Here the part of the wall which lies opposite the incandescent filament is coated with the fluorescent material 7, and this part also may be provided with a reflector.

In Fig. 3, is shown a gaseous discharge tube with light emission resulting from the negative glow. The glow-light forms itself on the two closely neighboring electrodes 8 and 9. The two

electrodes have here the known bee-hive shape, and between them is fixed a support 3a for the fluorescent material 7. This support may also be shaped like the stem 3 shown in Fig. 1.

- 5 In either case this stem 3 or 3a may consist of a fluorescent glass which, if desired, may be made opaque to increase its effect.

Fig. 4 shows an electric gaseous discharge tube with positive column light emission. The invention may be applied to elongated tubes with hot or cold electrodes, e. g., for advertising purposes and also for the modern high-pressure metal vapor tubes preferably with solid activated self-heating electrodes. In the example shown 15 the fluorescent material 7 may be applied to or in the wall of the tube.

The tube may also be shaped similar to Fig. 2. In this case, the light of the luminous arc (instead of the incandescent filament) is transformed on the fluorescent layer at the back and is emitted again to the front in a different color.

20 In the embodiment shown in Fig. 4, the tube contains a displacement body 3b, e. g., of glass, which is coated inside or outside with the fluorescent material 7. This body may advantageously consist of an ultra-violet transmitting material. A mirror-like coating may be used with advantage on or in the body. If the body is made hollow it may be filled also with a fluorescent powder, granules, solution or other fluent body, with the advantage that when the radiated surface layers are gradually deactivated, one can turn them again by shaking and thus bring out a more efficient surface layer. 8 and 9 are again the electrodes which may either remain cool or may be also self-heating or directly or indirectly heated by external circuits.

30 In Fig. 5 is shown a gaseous or vapor discharge tube which is operated in a rectifier type circuit. In this sketch 10 and 10 represent two anodes, 11 a glowing cathode and 12 a support for a fluorescent material.

45 In all of these examples the fluorescent material has been placed at the top or back or center where it will not be in the way of light passing to a zone in which it is to be utilized, but on the contrary the fluorescent material is exposed to said zone on the same side thereof as to the light source.

In the use of such devices the visible light passes from the filament or the discharge through the glass wall of the lamp while shorter wave length radiation is to some extent reflected and to some extent absorbed. Other light 5 radiated in another direction falls upon the fluorescent material where it is in part reflected back along a useful direction and in part is absorbed and reradiated as light of longer wave length. The ultra-visible radiation accompanying such light strikes the fluorescent material 10 both directly and after reflection from the walls of the lamp and in either case is converted into visible light and reradiated in a useful direction.

15 It is an advantage of the arrangement such as is shown in Figs. 1 and 3 that the fluorescent material, being in the center of the lamp is well placed to intercept light reflected from the wall of the tube.

Although I have referred particularly to 20 fluorescence it is to be understood that my invention is applicable equally to phosphorescence. I shall use the word "luminescence" to include both phenomena.

25 What I claim is:

1. In combination with a light source for radiating visible light in one or more given directions having a sealed envelope and means therein for producing light and ultra-violet 30 radiation, a supply of loose luminescent material exposed to ultra-violet radiation from the light source on a side thereof exposed to the space outside the envelope in at least one said given direction of radiation of visible light.

35 2. The combination as defined in claim 1 which further includes a vessel permeable to visible and ultra-violet radiation in which said loose luminescent material is combined.

40 3. The combination as defined in claim 1 which further includes a vessel permeable to visible and ultra-violet radiation in which said loose luminescent material is combined and the light source is a low pressure electrical discharge device adapted to give a diffuse luminous glow 45 surrounding said vessel containing the luminescent material.

EDMUND GERMER.