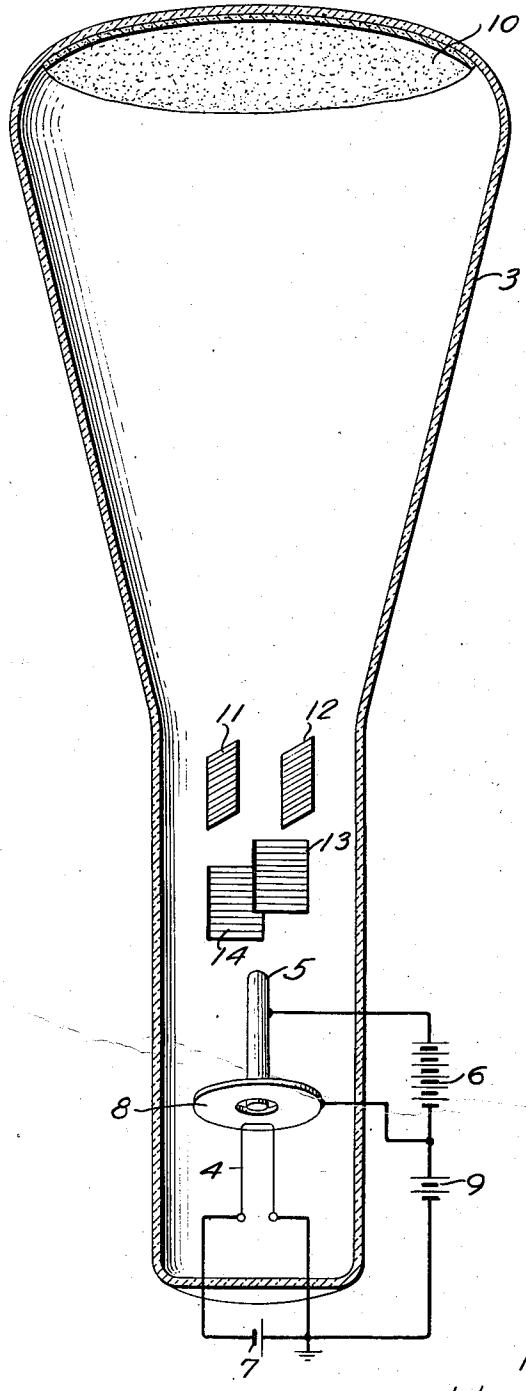
Oct. 19, 1926. 1,603,284

J. B. JOHNSON

ELECTRIC DISCHARGE DEVICE

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Inventor:
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# UNITED STATES PATENT OFFICE.

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## ELECTRIC DISCHARGE DEVICE.

Application filed November 24, 1922. Serial No. 602,947.

This invention relates to electric discharge devices, particularly devices of the cathode-ray type.

The object of this invention is to provide a fluorescent screen for an electric discharge device of such a character that the screen when fluorescent will be efficient for either visual or photographic observation. The fluorescent screen, of this invention may comprise equal parts of calcium tungstate and zinc silicate, spread on the inner surface of the tube, employing means such as water glass for a binder. Calcium tungstate when fluorescent emits a blue light, which, due to the fact that the light rays are near the ultra violet part of the spectrum, is very active on the photographic plate. Zinc silicate, however, when fluorescent gives a yellow green light which is many times brighter visually than that from calcium tungstate. By mixing the two in equal parts, a fluorescent screen may be produced which is more than half as bright visually as pure zinc silicate, and more than half as active photographically as pure calcium tungstate. A cathode-ray tube having such a composite screen is therefore capable of use both for obtaining photographs of any desired fluorescent pattern as well as for a visual observation of the same.

Referring to the drawing, a cathode-ray tube is illustrated therein of a type in which the fluorescent screen composition of this invention may be employed.

The cathode-ray tube 3 disclosed in the drawing is of the type described and claimed in U. S. Patent No. 1,565,855 granted December 15, 1925, on vacuum tubes. The tube, briefly described, comprises a hot cathode 4 and a hollow cylindrical anode 5, the anode 5 being maintained positive with respect to the cathode by a source of voltage 6, while the cathode 4 is heated by a suitable source of voltage 7. In order to aid in concentrating the electrons from the cathode 4, a ring electrode 8 may be made to center around the end of the anode adjacent the cathode, the ring electrode being made positive with respect to the cathode by a source of voltage 9. The electrons passing through the hollow anode 5 will be in the form of a narrow beam, causing a small spot of light on the fluorescent screen 10 at the other end of the tube. Deflector plates 11, 12, 13 and 14 may be employed as is well known, to move the cathode-ray beam in any desired manner, whereby the cathode-ray beam traces a fluorescent pattern on the screen 10. As described in my above mentioned application, the cathode-ray beam may be highly concentrated by the use in the tube of an inert gas, such as helium, at a low pressure for example of the order of the vapor pressure of mercury.

In order that the tube 3 may be satisfactorily employed for both visual and photographic work in the study of alternating current waves, this invention provides a special fluorescent screen composed preferably of equal parts of calcium tungstate and zinc silicate, held to the walls of the tube by a suitable binder, such as water glass. The pure calcium tungstate emits a blue light, when fluorescent which is about thirty times as active on the photographic plate as the yellow green light produced by zinc silicate, while the silicate gives a light which is many times brighter visually than that from the tungstate. By mixing the two materials in equal parts, a screen is produced which is more than half as bright visually as pure zinc silicate, and more than half as active photographically as pure calcium tungstate. This is due to the fact that when the two materials are so mixed, no injurious chemical or other interaction results which would serve to impair or destroy the fluorescent phenomena characteristic of each when taken in its pure state. The light waves given off by the calcium tungstate are for the most part near the ultra violet region of the spectrum, while the light waves given off by the zinc silicate are for the most part in the yellow green band of the spectrum.

It is of course to be understood that this invention is not limited to the use of calcium tungstate and zinc silicate in equal amounts since they may be combined in other proportions to suit particular needs. Furthermore, the invention is not limited to a fluorescent screen composed of zinc silicate and calcium tungstate since the invention broadly contemplates obtaining a fluorescent screen efficient for both visual and photographic work. Zinc sulphide, for example, may be satisfactorily employed as a substitute for zinc silicate since both of these zinc compounds fluoresce with a yellow light

satisfactory for visual work. The calcium tungstate, for example, may be replaced by any other substance giving a blue light under fluorescence, providing, of course, that the two substances employed in any particular case do not react when combined to destroy their fluorescent properties.

The invention claimed is:

1. In an electric discharge device, a fluorescent screen comprising a mixture of a zinc salt and calcium tungstate.

2. In an electric discharge device, an internal coating comprising a mixture of zinc silicate and calcium tungstate.

3. In an electric discharge device, an internal coating comprising a mixture of a fluorescent salt of tungsten and a fluorescent salt of zinc.

4. In an electric discharge device, a coating comprising a material fluorescent strongly with a yellow light as well as a blue light.

5. In a cathode-ray tube, an internal coating composed of means emitting a strong yellow light and a strong blue light when subjected to an electron bombardment.

In witness whereof, I hereunto subscribe my name this 21st day of November A. D., 1922.

JOHN B. JOHNSON.