IMAGE REPRODUCTION FLUORESCENT

Filed Nov. 3, 1937

April 23, 1940. 1 LANGMUIR 2,198,479

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Fig. 1.

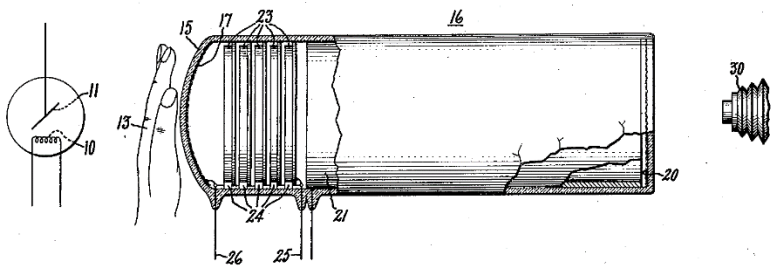


Fig. 2.

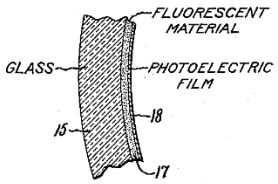
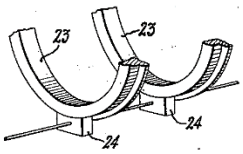


Fig. 3.



Inventor:
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FLUORESCENT IMAGE REPRODUCTION Filed Nov. 3, 1937

Inventor Irving Lam muir,

DESCRIPTION

Hiq Attorney.

Patented Apr. 23, 1940 UNITED STATES PATENT OFFICE to General Electric of New York Company, a corporation Application November s, 1937, serial No. 172,509

3 Claims.

The present invention relates to image reproduction, and more particularly to improvements in image reproduction systems of the type described and claimed in Patent No. 2,158,853 of4 5 W. D. Coolidge, granted May 16, 1939, and assigned to the General Electric Company.

The aforementioned Coolidge patent discloses apparatus by means of which a relatively Weak or transitory primary visible image produced by a source of radiation, for example X-rays (including gamma-rays) or other ultra-visible radiations may be converted into a secondary visible image of substantially greater intensity or greater This is ac. face which comprises fluorescent and photoelectric materials in close mechanical association.

The features of novelty which I desire to protect herein will be pointed out with particularity in the appended claims. The-invention itself, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the drawing, in which Fig.A 1 shows in partial section an image reproduction system suitably embodying the invention and Figs. 2 and 3 show fragmentary details of various parts of the construction of Fig. 1.

Referring particularly to Fig. 1 there is shown at the extreme left of the figure an X-ray tube comprising a cathode I0 and a target or anode II. poses radiations originating at the target II impinge upon an object to be examined, such an object being represented in the present case as a human hand I3; Radiations transmitted .through the object are caused to fall upon the end wall I5 of an evacuated transparent or translucent envelope I6, suitably of glass which constitutes the enclosure for an image reproduction device. In accordance with the invention the wall I5 is provided with common means whereby the transmitted X-radiations may be successively converted into a visible image and then into a beam of photoelectrons having a section pattern cor- In the use of this device for diagnostic pur- (Cl. Z-153) responding to that of the visible image. Such a means may include, for example, a combination of fluorescent and photoelectrlc materials applied to the inside of the wall I5. One particular combination which I consider suitable for this purpose comprises a layer of calcium tungstate supercially coated with a film of photoelectrically active material. The photoelectrlc lm is preferably at least slightly conductive in character and should be so thin as to `be substantially transparent. It may be composed, for example, of a deposit of slightly oxidized silver which has been activated with an alkali metal, preferably caesium. The physical structure of the composite surface is indicated in Fig. 2 in which I1 is a layer of a material which is adapted to iiuoresce under the influence of X-rays and I8 is a conducting transparent film comprising a photoelectric substance. In an alternative arrangement the uorescent and photoelectrlc materials may be admixed to form a single layer. Under the action of impinging X-radiations /the fluorescent material will form a visible image whose nature will be determined by that ofthe interposed object I3. The light thereby devel.- oped will in turn be effective to release electrons from vthe associated photoactive material in a pattern which corresponds closely to that of the image itself. As explained in the Coolidge application above referredto, the electrons so developed may be focused electron-optically to impinge on another fluorescent screen 20 where they will produce a secondary visible image corresponding in outline to the section pattern of the electron beam. If, during the transition'period the electrons are accelerated to a sufficiently high velocity, this secondary image may be of substantially greater intensity than the primary image. Consequently, a camera positioned as indicated at 30 may obtain a good photographic record of the image even though a relatively weak source of X-rays is employed.

In the present instance a suitable accelerating and focusing system is shown as comprising an accelerating electrode 2I adapted to be charged to a high potential with respect to the emissive lsurface I8 and an associated focusing electrode mating at the cathode surface I8 may be caused to form on the fluorescent screen 20 a clear and intensified secondary image corresponding to the primary image which appears on the surface I1. In some cases it may be desirable to augment the electron-optical lens formed by the electrodes 2| and 23 by means of additional magnetic or electrostatic focusing means.

While I have shown particular embodiments of my invention, it will be understood by those skilled in the art that many modifications may be made without departing from the invention, and I aim by the appended claims to cover all such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to obtain by Letters Patent of the United States is:

1. A composite electrode comprising a layer of calcium tungstate adapted to be excited to iiuorescence by the action of impinging radiations and a transparent film of oxidized silver thereon, said lm being photoelectrically activated with caesium, whereby fluorescence of the calcium tungstate layer results in electron emission from the electrode.

2. In an image-reproducing system, a source of primary radiations, an electrode exposed to the said primary radiations and having contiguously arranged uorescent and photoelectric components, the iiuorescent component being adapted to luminesce in response to impingement of the said primary radiations thereon, and the photoelectric coinponent being substantially non-emissive when excited solely by said primary radiations but being capable of effective electron emission when excited by light from the iiuorescent component, and image-reproducing means for receiving electrons emitted by the photoelectric component in response to excitation of the flucrescent component by the said primary radiations.

3. In an image-reproducing system, a source of X-rays deiining a primary image, an electrode exposed to the saidsource and having a photovelectric component arranged in direct contact with a fluorescent component which is adapted to luminesce when excited by X-rays, the said photoelectric component being substantially nonemissive when excited solely by X-rays but being

RÉFÉRENCÉ PAR

Brevet citant	Date de dépôt	Date de publication	Déposant	Titre
US2523132 *	10 août 1949	19 sept. 1950	Westinghouse Electric Corp	Photosensitive apparatus
US2527913 *	4 août 1948	31 oct. 1950	Radio Industrie Sa	Photoelectric device
US2530517 *	1 nov. 1944	21 nov. 1950	X Ray Electronic Corp	X-ray testing and measuring method and apparatus
US2555423 *	16 avr. 1947	5 juin 1951	Emanuel Sheldon Edward	Image intensifying tube
US2555424 *	9 mars 1948	5 juin 1951	Emanuel Sheldon Edward	Apparatus for fluoroscopy and radiography
US2586391 *	8 juil. 1947	19 févr. 1952	Emanuel Sheldon Edward	Device for projection of microwave images
US2586392 *	9 déc. 1948	19 févr. 1952	Emanuel Sheldon Edward	Motion-picture camera for chi-ray images
US2593925 *	5 oct. 1948	22 avr. 1952	Emanuel Sheldon Edward	Device for color projection of invisible rays
US2603757 *	5 nov. 1948	15 juil. 1952	Emanuel Sheldon Edward	Photocathode
US2612610 *	6 nov. 1948	30 sept. 1952	Westinghouse Electric Corp	Radiation detector

Brevet citant	Date de dépôt	Date de publication	Déposant	Titre
US2660539 *	25 févr. 1950	24 nov. 1953	Westinghouse Electric Corp	Method for producing a fluorescent screen
US2660686 *	19 juin 1948	24 nov. 1953	Westinghouse Electric Corp	Fluorescent screen
US2666864 *	20 janv. 1950	19 janv. 1954	Westinghouse Electric Corp	Image intensifier tube
US2681868 *	10 août 1949	22 juin 1954	Westinghouse Electric Corp	Image amplifier
US2690516 *	21 avr. 1948	28 sept. 1954	Emanuel Shcldon Edward	Method and device for producing neutron images
US2692299 *	11 déc. 1948	19 oct. 1954	Westinghouse Electric Corp	Image contrast intensifier
US2692300 *	6 juil. 1950	19 oct. 1954	Hogan Alsede W	Electric image formation and control apparatus
US2727183 *	22 déc. 1948	13 déc. 1955	Westinghouse Electric Corp	Radiation detector of the scanning type
US2739257 *	15 oct. 1948	20 mars 1956	Emanuel Sheldon Edward	Device for x-ray motion pictures
US2739258 *	19 mai 1950	20 mars 1956	Sheldon Edward E	System of intensification of x-ray images
US2782332 *	6 avr. 1949	19 févr. 1957	Emanuel Sheldon Edward	Method and device for reading images of invisible radiation
US2804561 *	1 juin 1951	27 août 1957	Emanuel Sheldon Edward	Chi-ray camera
US2864031 *	30 déc. 1950	9 déc. 1958	Rca Corp	Electrical storage tube
US2955219 *	16 févr. 1959	4 oct. 1960	Rauland Corp	Electron discharge device
US3014147 *	9 avr. 1947	19 déc. 1961	Rca Corp	Infra red image tube
US3400291 *	28 août 1964	3 sept. 1968	Emanuel Sheldon Edward	Image intensifying tubes provided with an array of electron multiplying members
US3443104 *	17 févr. 1966	6 mai 1969	Rauland Corp	Image intensifier tube with shading compensation
US3461332 *	26 nov. 1965	12 août 1969	Edward E Sheldon	Vacuum tubes with a curved electron image intensifying device

Brevet citant	Date de dépôt	Date de publication	Déposant	Titre
US3922523 *	16 mai 1973	25 nov. 1975	Sheldon Edward E	Apparatus for producing x-ray images as radiographs
US4186302 *	12 juil. 1978	29 janv. 1980	Diagnostic Information, Inc.	Panel type X-ray image intensifier tube and radiographic camera system
US4300046 *	31 août 1979	10 nov. 1981	Diagnostic Information, Inc.	Panel type X-ray image intensifier tube and radiographic camera system
US6895077	21 nov. 2001	17 mai 2005	University Of Massachusetts Medical Center	System and method for x-ray fluoroscopic imaging
US20030169847 *	21 nov. 2001	11 sept. 2003	University Of Massachusetts Medical Center	System and method for x-ray fluoroscopic imaging
DE968667C *	4 avr. 1952	17 avr. 1958	Philips Nv	Bildwandler

* Cité par l'examinateur

CLASSIFICATIONS

Classification aux États-Unis	250/214.0VT, 430/139, 313/251, 313/527
Classification internationale	H01J29/10, H01J29/38
Classification coopérative	H01J29/385
Classification européenne	H01J29/38B