PUBLISHED

MAY 25, 1943.

BY A. P. C.

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DEVICE FOR THE PRODUCTION OF VISIBLE OR PHOTOGRAPHIC IMAGES WITH EMPLOYMENT OF NEUTRONS AS DEPICTING RADIATION

Filed July 3, 1941

Serial No. 401,038

Fig. 1.

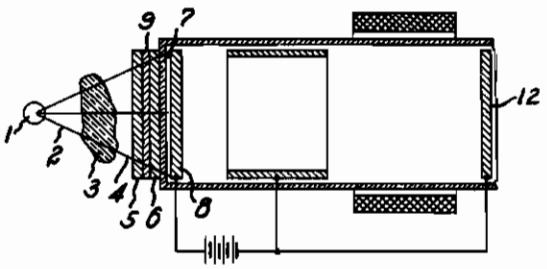


Fig. 2.

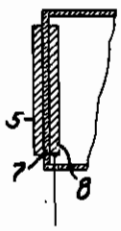
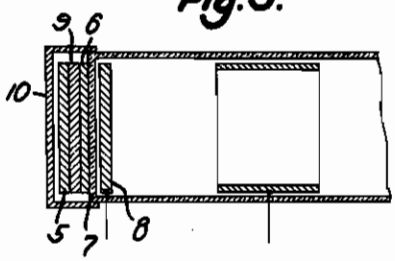


Fig. 3.



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Published May 25, 1943 Serial No. 401,038

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DEVICE FOR THE PRODUCTION OF VISIBLE OR PHOTOGRAPHIC IMAGES WITH EMPLOYMENT OF NEUTRONS AS DEPICTING RADIATION

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Application filed July 3, 1941

A device for the production of visible or photographic images of objects with employment of neutrons as depicting radiation has been proposed, in which in a neutron-reactive layer heavily charged particles or electrons are produced by the depicting neutrons, and these charged particles or electrons release in the neutron-reactive layer or in a neighbouring layer slow electrons, which are accelerated by electric fields and, after they have passed through an electron-optical system, produce a picture on a luminescent screen or on a photographic layer. With this device it is possible to produce pictures very rich in contrast even with a neutron radiation of low intensity.

At the production of such neutron-image-converter difficulties are caused under circumstances thereby that the neutron-reactive layer and the layer from which the slow electrons are released react the one with the other in undesired manner during the production of the image-converter, for instance at the baking out of the vacuum tube. Some neutron-reactive layers also partly lose their efficiency at the heating to higher temperatures which for the object of baking out can be hardly avoided in the course of the production of the image-converter.

It is an object of the present invention to obviate these difficulties involved in the production of the apparatus formerly described. For this and other inventive purposes the neutron-reactive layer is applied outside the vacuum space, and at this point the wall of the vessel is made such that it lets pass through the radiation serving for the releasing of the slow electrons.

In a neutron-image-converter, in which the heavily charged particles or electrons produced in the neutron-reactive layer by the depicting neutrons release in a neighbouring luminescent mass a radiation, which in turn only releases slow electrons in a neighbouring layer, it is advisable to provide under certain circumstances in the arrangement according to the invention also the luminescent mass outside the vacuum tube. For intensifying the effect, a surface, which reflects the radiation emitted by the luminescent mass and lets pass through the charged particles exciting the luminescent mass, is preferably provided on the side of the luminescent mass remote from the vacuum space.

For reducing unsharpness and losses from reflection on the wall of the tube, it is advisable to apply directly upon the wall the neutron-reactive mass or the luminescent mass, or, if desired, both masses mixed.

If in the neutron-reactive mass electrons are produced which in turn have to release slow electrons in the interior of the vacuum space from another layer, the wall of the tube at this point must let pass the electrons released from the neutron-reactive layer.

Some substances for the neutron-reactive layer, for instance metallic lithium, are especially affected by moist air, so that their efficiency decreases gradually. For increasing their durability it is therefore advisable in such masses for neutron-reactive layers and similar sensitive luminescent masses, to house the neutron-reactive mass, if desired together with the luminescent mass and the reflecting layer, in the interior of a closed space adjoining the wall of the vacuum tube, said space being evacuated or filled with a gas which does not affect said substances.

Embodiments of the arrangement according to the invention are shown partly in diagrammatic illustration in the figures of the accompanying drawing.

The neutron beam 2 serving for depicting starts from the source of neutrons 1 and traverses the body 3 to be depicted. The depicting neutron radiation 4 impinges upon the neutron-reactive layer 5 arranged outside the vacuum space and produces in this layer heavily charged particles or electrons. The intensity of the thus produced heavily charged particles or electrons is different from place to place according to the neutron radiation locally weakened by the body 3 to be depicted. The heavily charged particles or electrons release in and adjacent 6 of luminescent mass a radiation, which passes through the wall 7 of the tube, which at this point lets pass radiation, into the vacuum space and releases there slow electrons from a photo-sensitive layer 8. These slow electrons are accelerated and can be collected electron-optically in a manner known per se upon an luminescent screen or upon a photographic layer to produce an image of the object.

Between the layer 6 of luminescent mass and the neutron-reactive layer 5 a reflecting surface 9 may be provided for intensifying the effect, said surface reflecting the radiation emitted by the luminescent mass through this mass itself into the interior of the vacuum space upon the photo-sensitive layer. This surface 9 lets pass through the heavily charged particles or electrons produced by the neutron in the layer 5.

The luminescent mass and the neutron-reactive layer mass may be applied directly onto the

wall 7 of the tube the one mixed with the other as well as singly.

The wall must be such that it lets pass through electrons at 7 in case electrons are emitted from the neutron-reactive layer 5 which, in the form of construction shown in Fig. 2, is directly adjacent to the wall, said electrons having to release slow electrons from the layer 8 which is in the interior.

In the embodiment shown in Fig. 3, the neutron-reactive layer 5, inclusive the luminescent mass 6 and the reflecting layer 6 are housed in the interior of a space closed by a cap 10, said space being directly adjacent to the wall and evacuated or filled with a gas which does not affect the said masses.

Another advantage of the arrangement according to the invention consists in that, without alteration of the evacuated image-converter-tube, the neutron-reactive layers in which the heavily charged particles or electrons are produced by the depicting neutrons can be exchanged. It is therefore possible to make preferably reactive the device for neutrons of different speed with the same image-converter-tube merely by exchanging the neutron-reactive layers or luminescent masses arranged on the outer side.

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