PUBLISHED
MAY 25, 1943.
BY A. P. C.

HANNS-HEINZ WOLFF

CATHODE RAY TUBE

Filed April 17, 1939

Serial No.
268,262

2 Sheets-Sheet 1

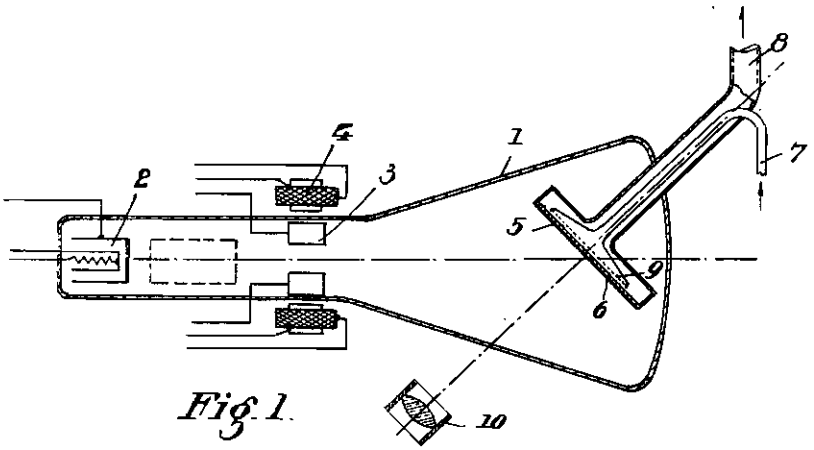

Fig. 1.

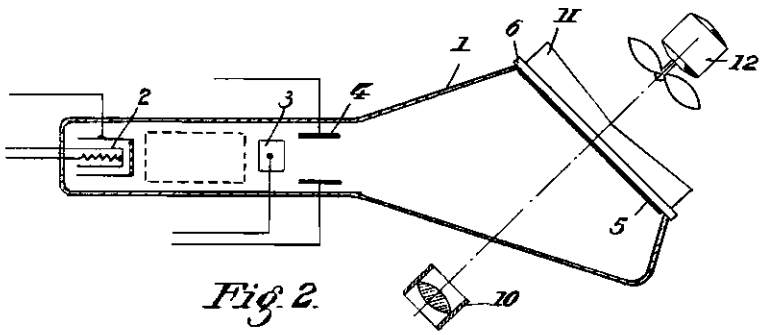

Fig. 2.

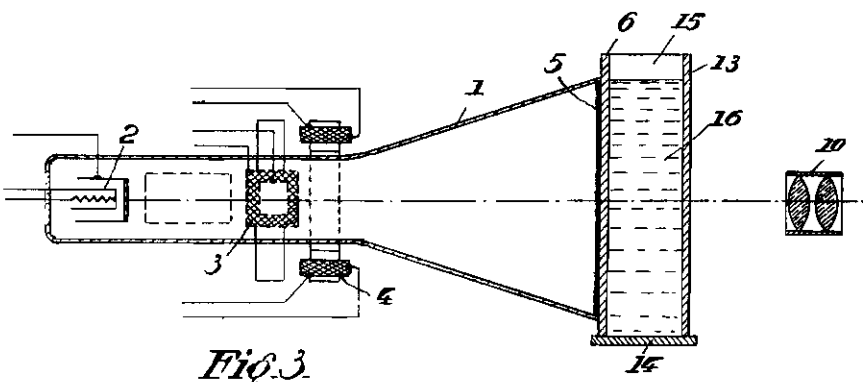

Fig. 3.

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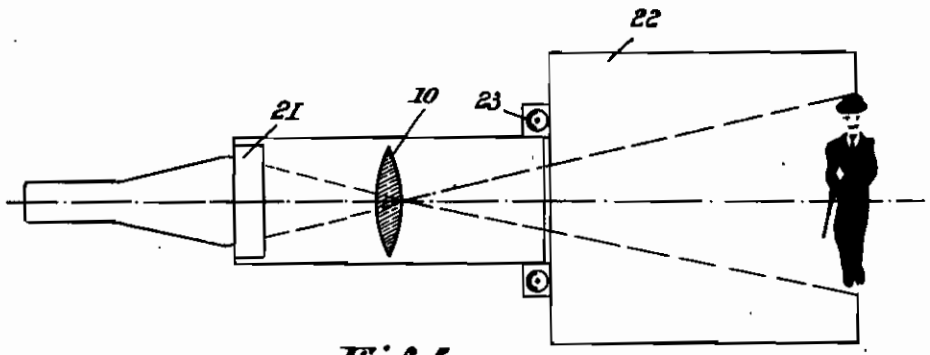

Fig 4.

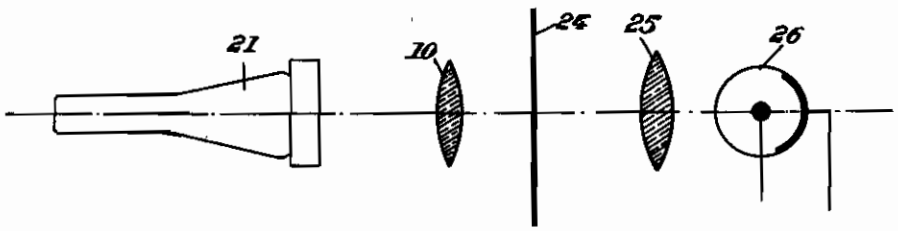

Fig 5.

Inventor:
Hanns-Heinz Wolff

Published May 25, 1943

Serial No. 268,262

ALIEN PROPERTY CUSTODIAN

CATHODE RAY TUBE

Hanns-Heinz Wolff, Berlin, Germany; vested in the Alien Property Custodian

Application filed April 17, 1939

It is sometimes desirable, and in many cases, for example in television scanning apparatus, absolutely essential, to have a cathode ray tube, the image screen of which exhibits no after-lighting effect, or at least only a very brief and/or very weak after-lighting effect. The known luminous screen materials, so far as they possess a good conversion factor (ratio between the light intensity given off and the energy impinging on the screen), exhibit for the greater part a comparatively strong after-lighting effect. This is disclosed in particular exactly in the case of those luminous substances, the spectral range of which falls, from the light-intensity point of view, within the ranges in which the majority of photo-cells are particularly sensitive in response.

The present invention relates to cathode ray tubes which are so designed, or can be so operated, that the after-lighting effect can be reduced to an amount no longer adapted to create interference. It has been found that if the material of the luminous screen is maintained in a cool condition, and is preferably greatly under-cooled, the after-lighting effect can be very much shortened or even practically suppressed entirely.

The present invention makes use of this property, and consists in the provision of means which enable the substance of the luminous screen of a cathode ray tube to have cooled or undercooled. The invention will be described more particularly in conjunction with certain possible embodiments.

In Fig. 1, 1 is a glass bulb, in which a cathode 2 produces an electronic beam, which is concentrated by an electron-optical system indicated in broken lines and is deflected in the vertical and horizontal directions by a pair of deflecting plates 3 and a pair of coils 4. The substance of the luminous screen 5 is provided on a plate 6, which preferably consists of copper or another good conductive material and is cooled by a cooling current, such as a current of water, which is supplied at the rear through the pipe 7 and is discharged through the pipe 8. The supply of the cooling current to the plate 6 preferably takes place in such fashion that this current is distributed as evenly as possible over the entire surface and, for example by means of a mouthpiece 9 constructed in the form of a rose, flows over the rear of the plate 6. The image resulting on a luminous screen 5 can then be utilized in the known fashion, for example by way of an optical system 10.

The cooling of the luminous screen 5 can also be performed in such a manner that this luminous screen forms the termination of the bulb, as illustrated in Fig. 2. In this figure the bulb 1 is connected in vacuum-tight fashion with the plate 6 carrying the luminous screen. The plate 6 can be furnished with special cooling ribs 11. The cooling in this case takes place by means of a fan 12, which is arranged behind the plate 6 and projects a cooling current of air on to the rear of the plate 6. The remaining elements are furnished with the same numerals as in Fig. 1.

In the arrangements described above the support the luminous screen has been assumed to be of a material impervious to light, although light-transmissive materials may naturally be employed also in these arrangements. If it is desired to employ a light-transmissive material, it is more simple to arrange the supporting plate vertically to the axis of the bulb, in order to avoid the disadvantages of the requirement for an optical or electrical trapezoidal distortion. An arrangement complying with these requirements is illustrated in Fig. 3. Here again the corresponding elements of the Braun tube are furnished with the same reference characters as in Fig. 1. The plate 6, which carries the luminous screen 5 and in this case preferably consists of a plano-parallel sheet of glass, forms the termination of the bulb 1 containing the cathode ray system 2, 3, 4. The plate 6 forms together with a second plate 13, which is conveniently also plano-parallel and preferably likewise consists of glass, in conjunction with the bottom 14 and side portions 15 a trough, which is filled with a cooling liquid 16, this liquid, for the purpose of obtaining a good cooling action, preferably being maintained in flow by an agitating mechanism or other known cooling means in order to effect continuous cooling, or also being additionally cooled by inflow from the exterior. The agitating means or the like would naturally require to be arranged in such a manner that they would not interfere with the optical path of light. In these cases the trough will preferably be made so large that the agitating means or cooling coils are arranged in parts extending laterally beyond the image screen. The use of cooling coils offers particularly advantages, as in this way there is avoided an excessive flow of the liquid and accordingly the formation of bubbles. The arrangement in Fig. 3 is also advantageous because it permits of the use of liquid air, an embodiment of the invention which is to be preferred particularly in

those cases in which particularly extensive suppression of the after-lighting effect is required. The embodiment of the single electrical elements of the arrangement can be carried out in the known fashion as desired. Attention must merely be paid to the fact that naturally in the case of arrangements in which the luminous screen is not disposed vertically to the optical system for the electronic beam either optical or electrical trapezium-distorting means will require to be employed.

The arrangement according to the invention is particularly suitable for television apparatus in which a scene requires to be scanned by a moving beam of light. The additional subject matter of the present invention is constituted by a television scanning device of such a kind in which use is made of a cathode ray tube of the type forming the subject matter of this invention. An embodiment by way of example is illustrated in Fig. 4. In the latter 21 is a tube according to the invention, in which by means of two scanning potentials a linear screen is produced, which by way of the lens 10 scans a scene occurring in a room 22. The beam of light proceeding from the luminous screen of the tube 21 and scanning the scene is reflected when falling on the scene and then impinges on one or more photo-cells 23 which, protected optically against the direct beam of light, give off or permit of the generation of a potential which is proportional to the light intensity of the point of impingement.

An additional field of use with respect to television transmission devices is found by the tube according to the invention in the scanning of films. An arrangement of this kind is illustrated in principle in Fig. 5. In this case the tube 21 according to the invention impinges by way of the lens 10 on the film 24, which according to the darker or lighter shade of the image point being scanned projects rays of light of greater or smaller intensity by way of a further lens 25 on to a photo-cell 26, which then supplies the desired potential or current.

The photo-cells 23 and 26 can naturally be furnished in the known fashion with secondary electron multipliers.

HANNS-HEINZ WOLFF.