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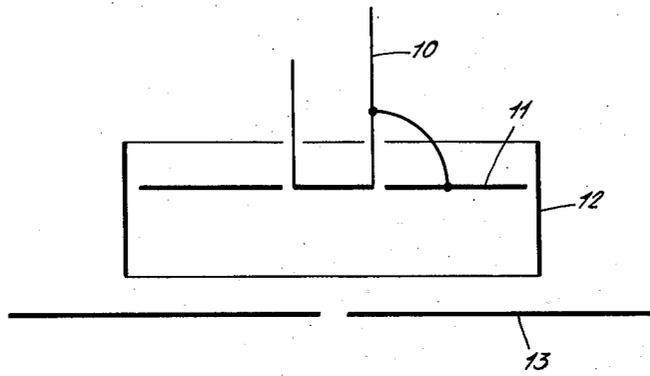
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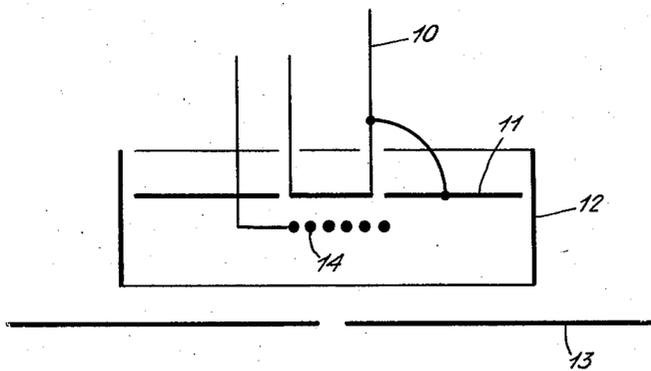
CATHODE RAY TUBE

Filed July 26, 1934

*Fig. 1*



*Fig. 2*



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## CATHODE RAY TUBE

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In Germany July 31, 1933

2 Claims. (Cl. 250—163)

In receiving television pictures by means of cathode ray tubes it is often noted that the distinctions between black and white parts of the television picture are sufficiently great as to brightness, but the intermediate tones do not present the proper shading.

The invention is based upon the teaching that this drawback can be eliminated by apparently minor changes in the construction of the tube proper and in the circuit used for operating the tube. There will be described in the following description and illustrated by schematical drawings such means which at least in approximation effect a proportional relation between the voltage available for the control of brightness and the cathode ray intensity applied to the luminescent screen.

This invention is related to my invention disclosed in my co-pending application No. 737,022 filed July 26, 1934, and entitled "Cathode ray tube" which covers generically the feature of an electron beam of constant intensity.

Referring now to the drawing, in which Fig. 1 shows diagrammatically one embodiment of my invention, and Fig. 2 shows schematically a modification of the embodiment shown in Fig. 1 of my invention, the invention will be described in detail.

In Fig. 1, 10 is a cathode, 11 a disk-shaped ring conductively connected to the said cathode. 12 designates a cylindrical electrode serving for the control of the luminosity, 13 represents the anode shutter. The action of the disk 11 resides in that all parts of the cathode 10 not located in the plane of the disk are covered in such manner that these cathode parts do not contribute in any way to the electronic current passing through the opening in the anode. Hence the disk 11 prevents that the electron current increases, dependent upon the voltage at the control cylinder 12, at a higher power, as occurs at any event, due to the dependence of the current of the emission upon the accelerating voltage (Langmuir's law).

Another means by which an improvement in the shading of the intermediate tones of the television picture can be insured, resides in that a grid is placed directly in front of the cathode having against the cathode a constant positive potential. This grid is designated by 14 in Fig. 2, this figure being otherwise identical with Fig. 1. The grid 14 prevents irregularities in the electron current which might be introduced at higher voltages at the control cylinder 12 due to the electrons emitted at cathode 10 which are located in the plane of the disc 11. Normally with low voltages on the control cylinder 12 these

electrons would be unaffected, but with increasingly higher voltages on the control cylinder 12, these electrons would be drawn into the electron stream. The action of the grid 14 thus consists in distributing the electron emission on the cathode 10 independent of the voltage at the control cylinder. The openings of the grid 14 can be considered an electron current source of constant intensity.

An improvement in the shading of the brightness on the luminescent screen of the intermediate tones can also be obtained by the arrangement of the circuit through which the voltage serving for the control of the brightness is passed. To this end, an impedance network is inserted in the lead to control grid or Wehnelt cylinder, this network providing a non-linear relationship between the input voltage and the output voltage. This relationship, i. e. the characteristic of the network is to be so chosen that the electron quantity passing through the anode of the cathode ray tube, and thereby the luminescent spot on the screen is proportional to the input voltage of the network. The network may consist for instance of resistances having a non-linear characteristic (current voltage characteristic) such as dry rectifiers or the like. This resistance is to be placed in series to and ahead of the control electrode, or in the train of the amplifiers furnishing the control voltage. The network may also be represented by one or a multiplicity of tubes of the amplifier. To this end, it must be worked on a suitably curved part of the characteristic of one or a multiplicity of amplifier tubes hereby it can be made use of the curvature existing in the vicinity of the upper bend of the characteristic of the amplifier and which is suited for compensating of the relationship between the emitting current and the voltage at the control electrode which at first essentially prevails according to the law of Langmuir. The network may also be formed of one or several diodes having incandescent cathodes. If the arrangement of the circuit is carried out in the described manner, a relation of greater linearity between the control voltage and the brightness on the luminescent screen can be achieved, than would be possible by the use of means described in connection with the Figs. 1 and 2.

Having thus described the invention, what I claim is:

1. An electron discharge device in combination, an electron emitting cathode, an annular elec-

trostatic shield positioned coaxially and in register with said cathode, a mesh-like accelerating electrode disposed coaxially and in register with said cathode, a modulating electrode concentric with the aforesaid elements, and an accelerating annular disc element coaxially positioned with respect to said cathode and positioned more remotely from said accelerating electrode.

2. An electron discharge device in combination, an electron emitting cathode, an annular

electrostatic shield positioned coaxially and in register with and connected to said cathode, a mesh-like accelerating electrode disposed coaxially and in register with said cathode, a modulating electrode concentric with the aforesaid elements, and an accelerating annular disc element coaxially positioned with respect to said cathode and positioned more remotely from said accelerating electrode.

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