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W. D. COOLIDGE
CATHODE RAY SOUND RECORDING

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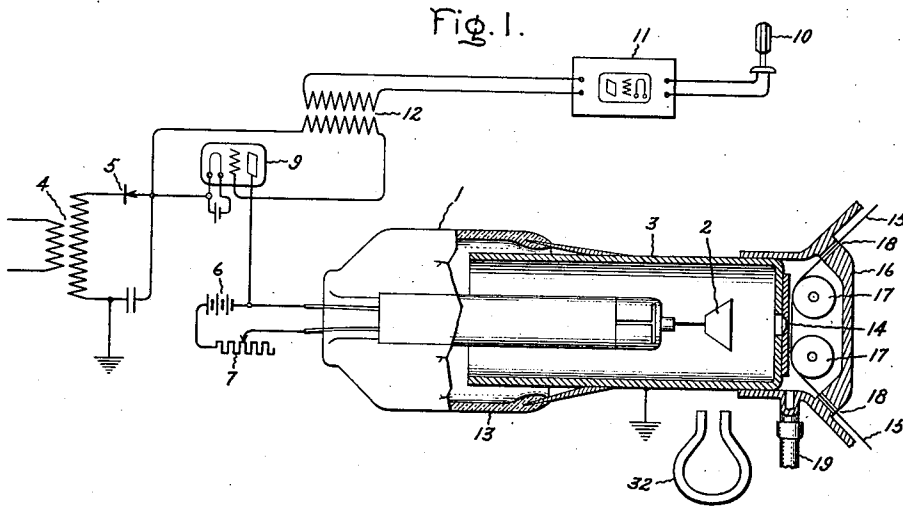


Fig. 2.

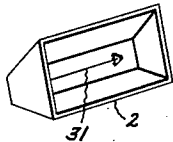


Fig. 3.

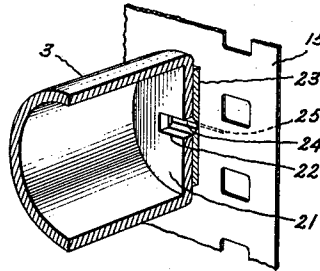


Fig. 5.

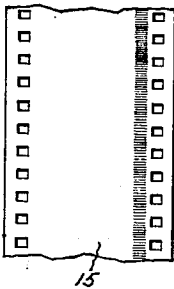
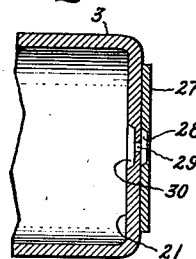


Fig. 4.



Inventor:
William D. Coolidge,
by *Charles R. T. Allen*
His Attorney.

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CATHODE RAY SOUND RECORDING

William D. Coolidge, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York

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10 Claims. (Cl. 179—100.3)

My invention relates to apparatus for recording electrical variations by the use of cathode rays. More particularly it relates to cathode ray recording apparatus in which the rays are ejected from the evacuated generator in which they are produced and effect the exposure of a member sensitive thereto arranged externally of the generator. It is the object of my invention to provide an improved apparatus of this character which is of simple form and which includes various features of construction which facilitates the operation and maintenance of the apparatus and the production therewith of improved records.

My invention will be better understood from the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

Referring to the drawing, Fig. 1 is a combined circuit diagram and side elevation partly in section of apparatus employing my invention; Fig. 2 is a detail of Fig. 1 drawn to a larger scale showing the cathode; Figs. 3 and 4 are details of Fig. 1 also drawn to a larger scale showing the Lenard window through which the rays are ejected; and Fig. 5 shows a sample of film having a sound record thereon made with the apparatus illustrated by Fig. 1.

While my invention is applicable to the recording of electrical variations of various forms whether of a continuous character or of a single momentary occurrence, I have chosen to illustrate it herein as arranged for the recording of variations corresponding to sound waves, in other words as a sound recording apparatus. The cathode ray generating device or tube 1 is of the type by which the cathode rays are ejected from the tube into the surrounding air. It is provided with the cathode 2 and anode 3 between which is applied the necessary high potential for the generation of the cathode rays by means, such for example, as the step-up transformer 4 through the rectifier 5, it being noted that the anode connection is through ground whereby the danger and inconvenience to the operator because of the high voltage is avoided. The cathode is heated by means of the battery 6 under the control of the rheostat 7. For the modulation of the cathode rays I have shown in the cathode anode circuit the electron discharge valve 9 whose cathode and plate elements connect respectively with the rectifier 5 and cathode 2. As the form of apparatus which I have illustrated is adapted for the recording of voice or music, I have shown the sound pick-up device

or microphone 10 connected through amplifier 11 and transformer 12 with the cathode and grid elements of the valve 9.

The anode 3 which is shown forming one end of the tube and which is secured to the body portion 13 in a vacuum tight manner is in the form of a cylinder enclosing the cathode and having an outer end wall which is provided with the Lenard window 14 through which the cathode rays are ejected from the tube. The construction of this window may follow various forms, two preferred forms being represented in the drawing and described hereinafter.

In order that scattering of the ejected rays may be reduced to a minimum after passing through the Lenard window I have provided means either for introducing between the window and the light sensitive member, which in the present case is represented as the film 15, a gas consisting of some element of low density, such for example, as hydrogen, or for partially evacuating the space between the window and the light sensitive member. For this purpose I have shown the casing 16 which engages the end of the anode 3 and encloses that portion of the film opposite and immediately adjacent to the end of the anode containing the Lenard window. The casing is shown provided with rolls 17 by which the film is supported so as to move past and close to the Lenard window it being understood that by suitable means, not shown, the film is caused to move at a uniform speed and is effectively shielded from light during the passage to and from the recording apparatus. Suitable means are provided in the film slots 18 in the casing to close the slots against the passage of gas or air yet without offering too great a resistance to the movement of the film. I have shown the casing 16 provided with the connection 19 by which a suitable gas, such as hydrogen, may be introduced into the casing or by which the casing may be partly evacuated in which case the connection 19 will lead to suitable exhausting means.

Referring now to Fig. 3 where I have shown on a somewhat larger scale the outer end portion of the anode 3 and the Lenard window by which the cathode rays are ejected from the tube to expose the film 15, it will be seen that in the end wall 21 of anode 3 I have provided the elongated or rectangular opening 22. Secured to the outer face of end wall 21, for example by soldering, is the member 23 which may be a metal foil, such as aluminum, which covers the opening 22. In that face of the member 23 adjacent to the anode I form the narrow channel 24 the

bottom of which has the length and breadth corresponding to the cross-sectional dimensions of the beam of cathode rays which are to be ejected from the tube and cause the exposure of the film. By the dotted lines 25 I have represented the area of the film exposed to the ejected rays. This area may, for example, be .001" in width and .1" in length. In order to facilitate the soldering of the member 23 to the anode I preferably construct this member having a thickness of approximately .003" and make the channel of such a depth that the material at the bottom thereof through which the rays are ejected has a thickness of approximately .001". It will be noted that the exterior face of member 23 past which the film is adapted to be moved in very close relation is flat, the channel being formed on the inner face which is not exposed to dust and dirt. In this form of my invention also it will be noted that the width of the bottom of the channel determines the width of the ejected beam of rays, the opening 22 in the end wall of the anode having a materially greater width.

In the modified form represented by Fig. 4 the member 27 which is similar to member 23 of Fig. 3 and is similarly secured to the end wall of anode 3 is provided with channel 28 whose width is materially greater than the desired width of the ejected beam of rays. In this modification the width of the ejected beam is governed by the width of the opening 29 in the end wall 21 of the anode which opening preferably is approximately .001" in width. In order to provide less thickness of material adjacent the opening 29 the end wall 21 is chamfered as at 30.

Inasmuch as the Lenard window 14 is long and narrow it is preferable that the cathode ray beam directed thereon shall have approximately the same form. For this purpose I employ a line cathode 2, such cathode being shown as a rectangular trough-shaped member arranged parallel to the window and having the linear filament 31 arranged in the bottom thereof whereby the cathode rays produced thereby are focused on the Lenard window. Instead of a linear filament 31 I may employ a small diameter coil filament.

For the purpose of centering the beam of cathode rays on the window I provide magnetic means, such for example as the permanent magnet 32 shown arranged externally of the tube and adapted to be adjusted in its mounting, not shown, so as to vary the position of the beam on the window.

I have chosen the particular embodiment described above as illustrative of my invention and it will be apparent that various other modifications may be made without departing from the spirit and scope of my invention which modifications I aim to cover by the appended claims.

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

1. Apparatus for recording electrical variations comprising a cathode ray tube constructed to eject cathode rays therefrom, said tube having a narrow window through which the rays are ejected on a member sensitive thereto, and having a line cathode arranged parallel with said window.

2. Apparatus for recording electrical variations

comprising a cathode ray tube constructed to eject cathode rays therefrom on an external photographic member, said tube having a line focus cathode, means for modulating the rays in accordance with said variations, means for restricting the ejected rays to a narrow band parallel with the cathode, and means for centering the rays on said restricting means.

3. Apparatus for recording electrical variations on a photographic film comprising a cathode ray tube constructed to eject the cathode rays, said tube having a line cathode, and a narrow window parallel with the cathode through which the rays are ejected to the film, means for modulating the rays in accordance with the electrical variations and magnetic means for centering the rays from the line cathode on the window.

4. Apparatus for recording electrical variations comprising a cathode ray tube constructed to eject cathode rays, means for supporting a member sensitive to said rays externally of the tube, and means for reducing the scattering of the rays between the tube and the member.

5. Apparatus for recording electrical variations comprising a cathode ray tube constructed to eject cathode rays, means for supporting a member sensitive to said rays externally of the tube, and means for providing a medium between the tube and the member in which a reduced scattering of the rays occurs.

6. Apparatus for recording electrical variations comprising a cathode ray tube constructed to eject cathode rays, means for supporting a member sensitive to said rays externally of the tube in the path of the rays, and enclosing means for the member containing a gaseous medium whose density is less than that of air at atmospheric pressure.

7. Apparatus for recording electrical variations comprising a cathode ray tube constructed to eject cathode rays, means for supporting a member sensitive to said rays externally of the tube, an enclosing casing for the member and means for supplying hydrogen thereto.

8. In apparatus for recording electrical variations, a cathode ray tube having an anode forming a wall thereof and provided with an elongated opening for the passage of the cathode rays and a member secured to said anode over said opening having a portion of reduced thickness opposite said opening through which portion the rays are ejected.

9. In apparatus for recording electrical variations, a cathode ray tube having an anode forming a wall thereof and provided with an elongated opening for the passage of the cathode rays and a member secured to the exterior of said anode over said opening having a ray transmitting channel formed in the face thereof adjacent to the anode.

10. In apparatus for recording electrical variations, a cathode ray tube having an anode forming a wall thereof and provided with an elongated opening for the passage of the cathode rays and a member secured to the exterior of said anode over said opening having a channel narrower than said opening formed in the member on that face thereof adjacent to the anode.

WILLIAM D. COOLIDGE.