March 28, 1933. F. K. CROWTHER 1,902,814

RECORDING OF SOUNDS

Filed Dec. 23, 1930

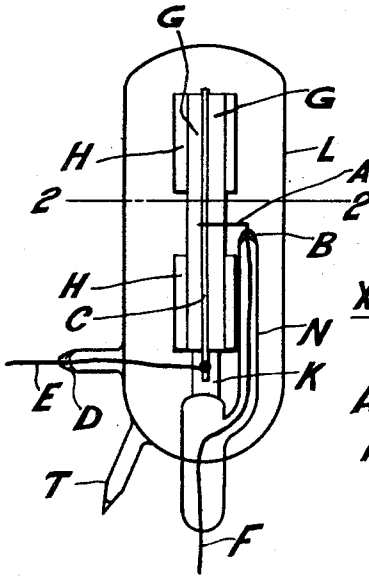


Fig.1.

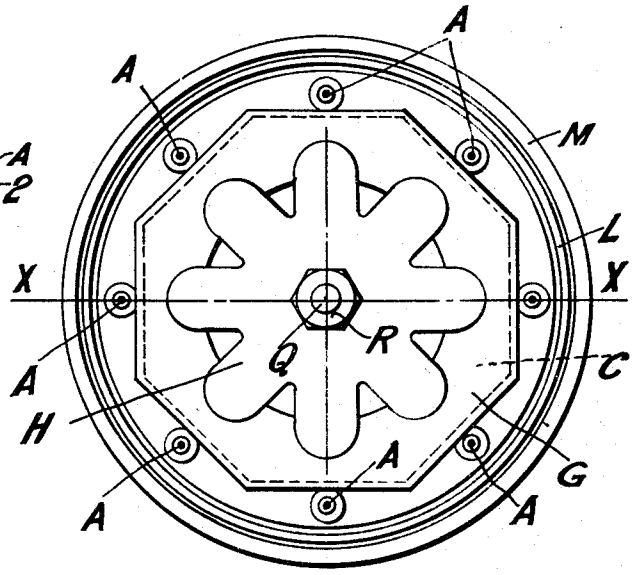


Fig.3.

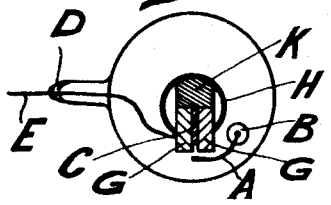


Fig.2.

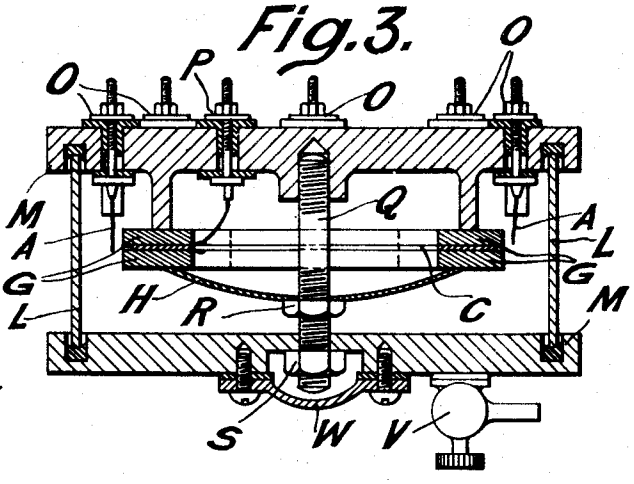


Fig.4.

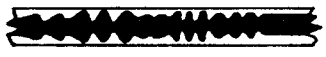


Fig.5.



Fig.6.

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UNITED STATES PATENT OFFICE

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RECORDING OF SOUNDS

Application filed December 23, 1930, Serial No. 504,437, and in Great Britain August 25, 1930.

This invention relates to sound recording and consists of a new method of and means for recording sound photographically.

In the recording of sound on photographic film there are two well known processes, one "variable density" and the other "variable area". If the variable density process is used some type of discharge tube can be employed which will respond equally well to the "high" as to "low" frequencies of sound. The difficulties of the variable density method of recording are experienced during the process of making prints or copies of the original record, as a true print must have the same range of densities as the negative. With the variable area method of recording as now practiced difficulties are experienced obtaining mechanically moving parts to respond to frequencies of, say 5,000 per second and over. On the other hand with the variable area method the copy or print from the negative only consists of a black and a white portion which can be obtained with comparative ease and reliability. The object of this invention is to provide a method of and means for making photographic sound records of the variable area type and the invention comprises a discharge tube so constructed as to overcome the difficulties of loss of high frequencies due to inertia of mechanically moving parts.

The method according to our invention consists in photographically recording a line of light whose length is caused to vary according to the sound modulations. The invention further includes a special form of electrical discharge tube by means of which the method can be accomplished.

In the accompanying drawing discharge tubes by means of which the new method can be practiced are illustrated by way of example.

Figure 1 is a front elevational view of one form of electrical discharge tube constructed according to the invention. Figure 2 is a section thereof on the line 2—2 of Figure 1. Figure 3 is an end view of a modified construction of discharge tube. Figure 4 is a section on the line 4—4 of Figure 3. Figure 5 shows diagrammatically the form of the sound record on the negative and Figure 6 shows the form of such record when printed from the negative in the usual way.

Referring to Figures 1 and 2 C designates the cathode of the discharge tube. This cathode is made of a thin strip of a suitable metal with two pieces of quartz or like insulation G on each side so arranged that the quartz overlaps the cathode as shown at X in Figure 2. The cathode and the quartz are held together by means of the two spring clips H. The complete cathode is supported in the glass container L by means of the glass rod K which has been ground so as to fit in between the spring clips H and the quartz G. This glass rod is sealed into the end of the glass container. Connection is made to the cathode G by means of the wire E which is sealed into container L at D. The anode consists of the wire A which is sealed into the glass tube N at B. The tube N is in turn sealed into the end of the container L.

The tube itself is then filled with a suitable gas such as nitrogen at a pressure which gives the desired length of glow for the working current. Such pressure is fairly high being of the order of 5 cms. of mercury.

Referring to Figures 3 and 4 the cathode C is shown in the form of an octagon, but other shapes may be adopted. The metallic cathode C has two pieces of insulating material (such as quartz) G placed one on each side. These insulating pieces being so shaped that they overlap uniformly the metal at the edges as shown at X in Figure 3. The complete cathode is mounted on the end plate M of the container as shown in Figure 4 where H is a spring spider which is compressed by the nut R. Connection to the cathode is made through the pin P which has suitable washers to ensure electrical insulation and a gas tight joint is made in the end plate M. In this construction there are as many anodes as there are faces to the cathode as shown in the drawing at A. These anodes consist of small lengths of wire fixed to pins O which are similar in construction to the cathode pin P. For safety a short length of insulating tube is placed round these wires to ensure the dis-

charge only takes place at the end of the anode wire.

The two end plates M can be either metal or an insulating material such as bakelite, and the body of the container L can be of any transparent material such as glass or quartz. The annular casing L is bedded at its edges into some yielding material such as rubber so that when it is clamped between the end plates by the nut S a gas tight joint is made. The clamping nut S is made gas tight by means of the cap W. The tap V is for the purpose of filling the tube with the desired gas. A tube as shown has the advantage that the whole of the construction is on one end plate and as one face of the cathode becomes unusable for any reason, another face can be used without destroying the tube.

It will be understood that the tubes are constructed and operated in general upon known electrical principles.

The important feature is to provide a long cathode suported at the bottom of a groove of insulating material so that the cathode glow is a well defined line which can fluctuate in length in accordance with the sound modulations. In the drawing the anode is shown in all cases located at or about the centre of the cathode and with this arrangement the fluctuations in the length of the glow will occur equally on both sides of this centre point and the effect will be a duplicated record on each side of a centre line as shown in Figures 5 and 6. If, however, the anode were arranged at one end of the cathode the fluctuations in length would occur in one direction only and the record on the film would be modified accordingly.

It will be understood that the photographic image of the cathode glow may be taken through a slit in accordance with known practice but by reason of the thickness of the glow being confined and maintained regular by the overlapping edges of the quartz insulation the slit can be dispensed with.

It will be found that by the method and apparatus herein before described variable area records can be taken without the aid of any moving mechanisms and thus all inertia effects are eliminated.

What I claim and desire to secure by Letters Patent is:—

1. An electrical discharge device for photographically recording sound comprising an hermetically sealed container an insulator within said container having a narrow longitudinal slot, a long cathode located at the bottom of said longitudinal slot, an anode adjacent said cathode and connections to establish electrical circuit.

2. An electrical discharge device for use in recording sound photographically comprising a gas filled container an insulator for the cathode located in said container, a narrow longitudinal slot in the face of said insulator, a long strip cathode located at the bottom of said slot, an anode adjacent the cathode and connections to establish the electrical circuit.

3. An electrical discharge device for use in recording sound photographically comprising a gas filled container an insulator for the cathode located in said container, a longitudinal slot in the face of said insulator, a long cathode located at the bottom of said slot, an anode adjacent the cathode and located midway of the length thereof and connections to establish the electrical circuit.

4. An electrical discharge device for use in recording sound photographically comprising a gas filled container, two slabs of insulation mounted in said container, a long cathode held between said insulating slabs and so disposed that the edges of the insulating slabs overlap the effective edge of the cathode, spring actuated means clamping the cathode between said slabs of insulation, an anode within the container adjacent the cathode and connections to establish the electrical circuit.

5. An electrical discharge device for photographically recording sound comprising a hermetically sealed container, an insulator within said container, a long cathode located at the bottom of a longitudinal slot in said insulator, an anode adjacent said cathode and located midway of the length thereof and connections to establish electrical circuit.

6. An electrical discharge device for photographically recording sound comprising a gas filled container, long slabs of insulation having flat opposing surfaces, a long cathode of strip material narrower in width than said slabs of insulation clamped between said slabs of insulation so that its effective edge is overlapped by said insulation, whereby the line of light produced by said cathode is confined as to width between the insulation but is capable only of longitudinal fluctuation, an anode point located adjacent said cathode and connections for establishing the electrical circuit.

7. An electrical discharge device for photographically recording sound comprising a gas filled container, long slabs of insulation having flat opposing surfaces, a long cathode of strip material narrower in width than said slabs of insulation clamped between said slabs of insulation so that its effective edge is overlapped by said insulation, whereby the line of light produced by said cathode is confined as to width between the insulation but is capable of longitudinal fluctuation, an anode point located adjacent said cathode and midway of its length whereby the fluctuations of the length of the line of light emitted by said cathode occur equally on both sides of said anode point and connections for establishing the electrical circuit.

8. An electrical discharge device for use in photographically recording sound comprising a gas filled container, slabs of insulation with said container, long slots in said insulation within which a cathode of strip material is mounted, a plurality of anodes at different positions adjacent said cathode and electrical connections for establishing electrical circuit to selectively employ any of said anodes whereby different cathode surfaces can be selectively employed.

In witness whereof I affix my signature.

FREDERICK KENNETH CROWTHER.