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G. FRIES

2,297,398

METHOD OF RECEIVING AND REPRODUCING FAST OSCILLATIONS

Filed Jan. 12, 1940

FIG. 1

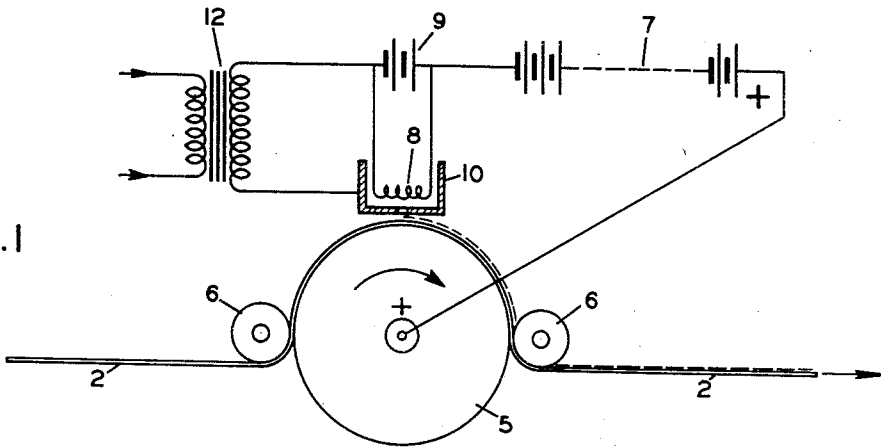


FIG. 2a

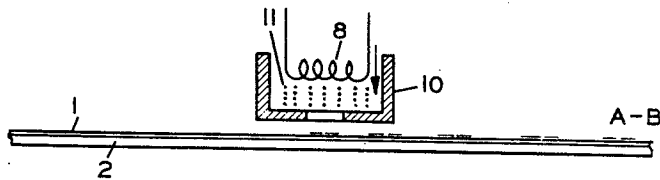


FIG. 2b

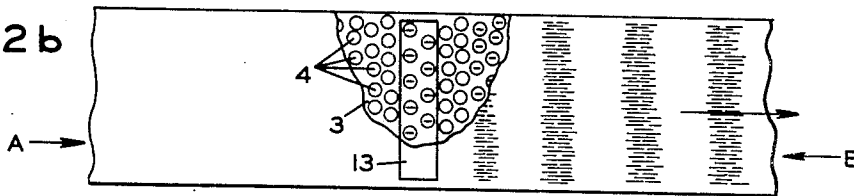
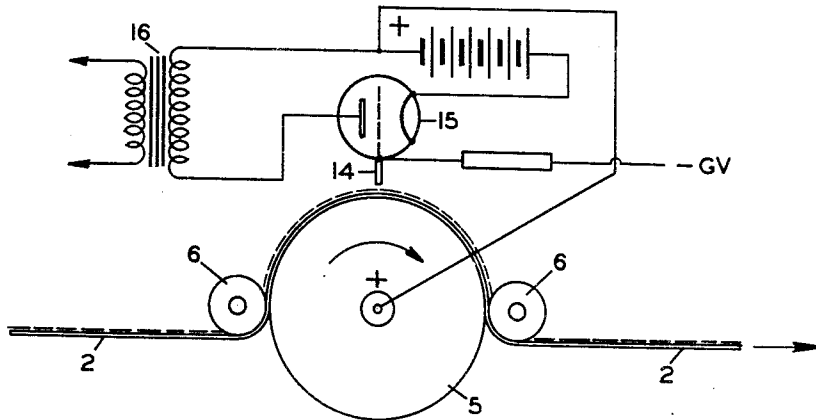


FIG. 3



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METHOD OF RECEIVING AND REPRODUCING
FAST OSCILLATIONSGustav Fries, Berlin-Charlottenburg, Germany;
vested in the Alien Property CustodianApplication January 12, 1940, Serial No. 313,571
In Germany December 30, 1938

1 Claim. (Cl. 178—6.6)

Various methods are at present available to make fast oscillations perceptible to the senses.

If for example oscillations of any kind (sound, light or the like) are to be ascertained they may be translated in electric current or voltage oscillations by means of a microphone, photoelectric cell or the like, and then be amplified. The electric oscillations thus obtained or which originally may have been of electric or magnetic nature are used for controlling the cathode ray of a Braun tube the intensity or deflection of which is influenced by said oscillations. The screen image of the tube obtained in this manner is photographed. It is, moreover, known to render visible the electrostatic charges formed upon the screen and then to photograph them. Oscillations recorded in this manner cannot be retranslated into oscillations of the same nature. For instance a sound- and high-frequency oscillation, for example one of a radio transmitter, recorded in this manner cannot be retranslated into the original oscillations.

Oscillations of acoustic and similar nature the frequencies of which are in the range of 30–10,000 cycles may be recorded in a well known manner, either mechanically, magnetically or photographically on suitable carriers and taken reproduced from a disc record, magnetic record, or light record. The recording and reproduction, however, is limited to a certain range of frequencies owing to the properties of the means employed. If it is necessary to record oscillations of more than 10,000 cycles, a record may electrostatically be made and later be rendered visible, however, ultra-sound waves of a frequency of 700 kilocycles are to be recorded, the oscillations cannot be reproduced from such record, because there is no possibility of picking them up.

The invention relates to a method of recording and reproducing without delay oscillations of any desired kind and frequency. The record is produced electrostatically, i. e. an electric load is applied to a carrier by means of a controlled cathode ray of suitable form whereby an electrical charge remains on said carrier. The latter, for instance a film, is provided with a metallic layer the individual molecules of which are insulated from one another. Such a layer for instance may be produced by reducing the silver bromide of a photographic layer to metallic silver, or by producing a fine gold deposit on the film by combining, by means of a diluted gold chloride solution the silver present upon the film with the chlorine of the gold chloride to form

silver chloride, thus precipitating metallic gold.

The static charge on the film record serves in the reproduction operation to control the flow of the electrons of an amplifier tube. The charge, therefore, is thus not first rendered visible. If, however, a sound record thus produced is to be multiplied, the multiplication of the record may be accomplished at a reduced speed by using the electrostatic charge for controlling known devices by means of which for instance a photographic record may be made which may be further multiplied if desired.

In the accompanying drawing a device is shown by way of an example for carrying out the method according to the invention.

In the drawing:

Fig. 1 shows the individual parts of the device in the position for recording;

Figs. 2a and 2b show in elevation and plan view the film or ribbon and illustrate how the electrostatic charge is applied to the film and retained, the applied charges being indicated by a minus (—) sign; and

Fig. 3 shows a device for reproducing oscillations from the record.

In the layer 1 applied to the film 2 there are embedded in the emulsion smallest metal particles 4 insulated from one another. The metal particles are diagrammatically illustrated at 3 on a greatly enlarged scale. During the recording operation shown in Fig. 1 the film band 2 is guided around a rotatable metal cylinder 5 and is pressed against this cylinder by rolls 6 of an insulating material. The cylinder 5 is maintained at a positive electric potential resulting by a source of current 7 which in turn is connected with the cathode 8 and its source of heating current 9. During operation the glowing cathode 8 emits smallest electric particles (electrons) which are attracted by the positively loaded cylinder and which on the way thereto reach the upper surface of the film band 2 and, in dependence on their number, electrically charge the metal particles 4 on the film 2. A grid 10 is interposed in the path of the cathode ray and provided with a slot or aperture 13 (Fig. 2b) for confining the stream of cathode rays. By means of the transformer 12 the grid is supplied with the modulated input current to be recorded, which thus controls the intensity of the cathode ray. As the film band 2 continuously passes along the aperture 13 in the direction of the arrow A, an electric charging of the metal particles 4 of the film 2 is effected in the rhythm of variation of the current applied at 12.

In order to pick up and reproduce the electric oscillations thus recorded which may have been supplied by a microphone, a photo-electric cell or the like, the charged film band 2 is again continuously guided over the metal drum 5 as may be seen from Fig. 3.

The pick up is effected electrostatically by passing the film band 2 along an electrode 14. The upper surface of the latter facing the drum 5 is as large as the slot 13 in the grid 10 used during recording. The upper surface of the electrode 14 forms one plate of a condenser with the drum 5 which by the charge on the film band 2 is charged in the same rhythm at which previously the metal particles 4 of the film band 2 were charged.

The electrode 14 is connected to the grid of the amplifier tube 15. The charge picked up from the film band 2 thus serves for controlling the flow of electrons in the tube 15. The amplified reproduced oscillations can be taken off at the transformer 16.

As during the recording the cathode ray is

devoid of inertia and may be controlled without lag, the highest frequencies may be recorded and also reproduced in dependence on the speed of the film and the fineness of the metal particles 4 applied to the film band 2, it being understood that the control of the flow of electrons of the amplifier tube 15 is directly controlled by electrostatic influences. Thus a complete independence of frequency is ensured by an absence of elements in the recorder and reproducer depending on certain frequencies.

What I claim is:

A method of receiving and producing fast oscillations, which consists in subjecting an insulating carrier to a cathode for electrostatically charging the carrier with an electric load, the molecules of which hold the load insulated from each other, and subjecting said carrier to the flow of electrons of an amplifier tube, the input of which is transferred and fixed for multiplying the electric load in its reproduction.

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