

July 29, 1930.

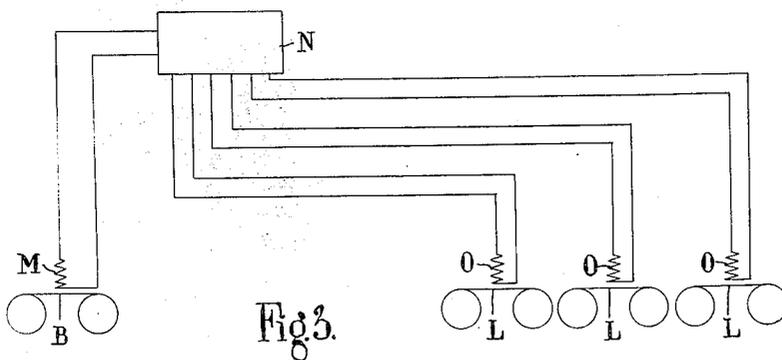
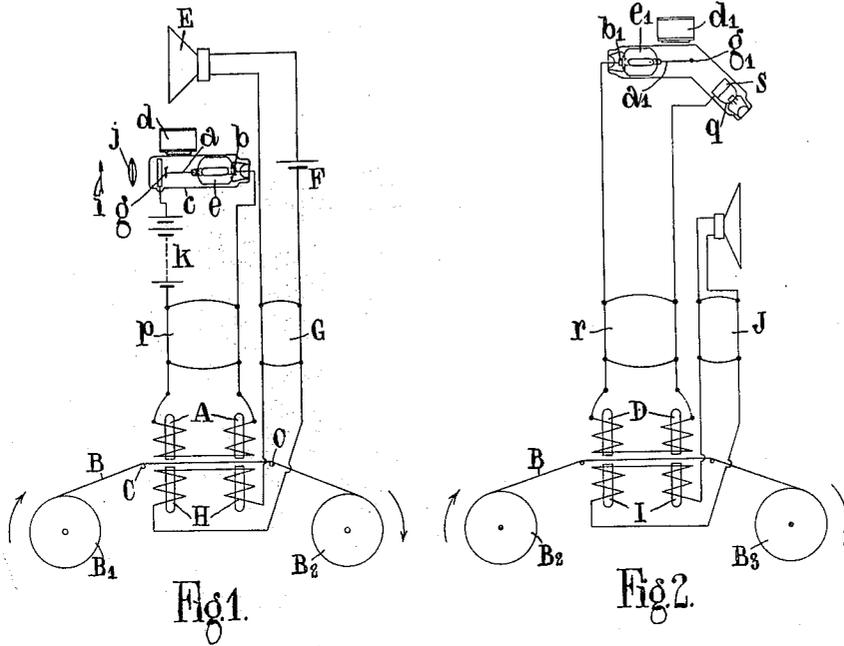
B. RTCHEOULOFF

1,771,820

MEANS OF RECORDING AND REPRODUCING PICTURES, IMAGES, AND THE LIKE

Filed March 9, 1927

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

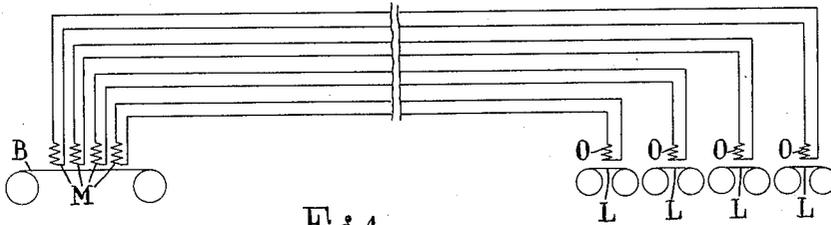


Fig. 4.

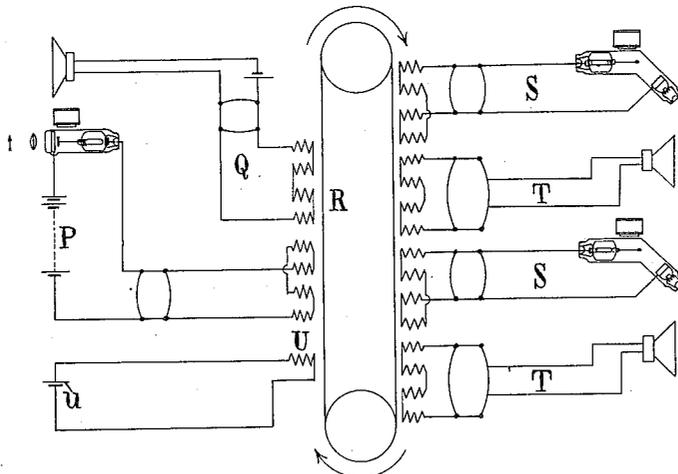


Fig. 5.

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# UNITED STATES PATENT OFFICE

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MEANS OF RECORDING AND REPRODUCING PICTURES, IMAGES, AND THE LIKE

Application filed March 9, 1927, Serial No. 174,009, and in Russia June 27, 1922.

This invention relates to a method of recording and reproducing pictures, images and the like of the kind in which the picture, image or the like is scanned by an oscillatory vertical and horizontal movement and in which the luminosity of the various points of the picture is converted into electric currents by means of a photoelectric element, selenium cell or the like.

In the method according to the present invention a picture, image or the like scanned in the manner above referred to is recorded along a line under the control of the photoelectric or like currents. The picture thus recorded along a line is subsequently reproduced by the impressions on the record being converted through the intermediary of electric means into a picture, image or the like lying in a surface.

The invention consists in obtaining the record above referred to by causing a strip, disc or cylinder of iron or other magnetic material to be magnetized in a well-known manner, such as according to the Poulsen and Pedersen system.

The invention further consists in obtaining a record of the magnetic character just referred to by the method described in my concurrent patent application No. 167,045, filed Feb. 9, 1927, and effecting the reproduction through the intermediary of a receiver such as described in my said concurrent application.

The invention is especially useful for use in connection with the simultaneous reproduction of sound.

In the accompanying drawings illustrating the invention diagrammatically and by way of example:

Figure 1 shows the arrangement for simultaneously taking an image and a sound record,

Figure 2 shows the arrangement for simultaneously reproducing an image and sound record,

Figures 3 and 4 illustrate two arrangements for producing a plurality of records from a master record, and

Figure 5 shows a further modification of carrying the invention into effect.

Referring to Figure 1, the picture, image or the like  $i$  is projected preferably through a lens or the like  $j$  on a photo-electrically sensitized point or small surface  $g$ , within a photo-electric cell  $c$ , which point or small surface  $g$  is caused to vibrate in two directions at right angles to one another, preferably through the intermediary of two electromagnets  $d$  and  $e$  acting at right angles to one another and causing two springs  $a$ ,  $b$ , connected together to vibrate in two directions also at right angles to one another, the free end of the spring  $a$  being provided with the photo-electrically sensitized point or small surface  $g$ . The photo-electrically sensitized point forms part of a photo-electric cell connected to the battery  $k$  and whilst it vibrates it scans the image projected within the photo-electric cell  $c$  thereby causing a series of fluctuations in the photo-electric current which fluctuations, preferably after they have been amplified by means of an amplifier  $p$ , correspondingly energize one or more electromagnets  $A$  arranged in front of a travelling strip  $B$ , of magnetic material, which is unrolled from a drum  $B_1$  and rolled on a drum  $B_2$ .  $C, C$ , are guides over which the strip  $B$  travels in front of the electromagnets  $A$ . The travelling strip may be replaced by a drum or disc of magnetic material. The fluctuations of the photo-electric current cause a certain magnetic impression to be effected along a line on the said strip, cylinder or disc. I thus convert the picture or image into a linear record.

The magnetic record obtained in the manner above referred to can subsequently be used for the purpose of reproducing the original image. For this purpose, (see Figure 2) the record  $B$  unrolled from the drum  $B_2$  is caused to travel past one or more electromagnets  $D$  and be rolled on a drum  $B_3$ . The said electromagnets are energized by a current forming part of a cathode or like tube  $e_1$  provided with a grid  $s$ , the potential of which is varied through the intermediary of the electromagnets  $D$  from the magnetic record  $B$ , preferably after they have been amplified by an amplifier  $r$ , which magnetic record causes the magnetic flux passing

through the cores of the electromagnets to be varied, thereby inducing electric currents which, after amplification, are superposed on the currents normally flowing through the cathode tube  $c_1$ . The cathode or like tube  
 5 also comprises two springs  $a_1, b_1$ , connected together, the free end of the spring  $a_1$  being provided with a fluorescent or luminescent point  $g_1$  and the compound spring being vibrated in two directions at right angles to  
 10 one another under the control of two electromagnets  $d_1, e_1$ , energized in the same manner as the electromagnets  $d, e$ , used in connection with the means provided with the apparatus used for the taking of the record.  
 15 The two springs are continuously vibrated and the cathode rays or electrons emitted by the incandescent filament  $q$  of the cathode tube impinge on the fluorescent or luminescent point  $g_1$ , the fluorescence or luminescence being varied according to the potential of the grid  $s$ .

The electromagnets used both in connection with the recording and the reproducing apparatus may be operated by alternating or interrupted direct currents, one of the electromagnets being operated with a frequency of about 10 periods per second and the other one with a frequency of about 1000 periods  
 20 per second.

When used for the simultaneous recording and reproducing of pictures, images or the like and sound, use may be made of the well-known Poulsen and Pedersen apparatus for causing fluctuations of currents produced under the control of a microphone to be recorded on the same strip of magnetic material, a loud speaker or the like being used in the reproducing apparatus. These arrangements are also illustrated in Figures 1 and 2. In Figure 1, E is the microphone, F the microphone battery and G an amplifier, the output circuit of which includes electromagnets H which produce a sound record on the travelling strip B, viz. on the opposite surface thereof. In Figure 2, I are electromagnets in the windings of which currents are induced by the magnetic sound record, J is an amplifier and K a loud speaker.

Referring to Figure 3, a series of magnetic records L may be produced from a master record B through the intermediary of an electromagnet M, and amplifier N and a corresponding number of series or parallel connected electromagnets O or pairs of electromagnets arranged to act separately on the various strips of magnetic material L on which the record is to be produced. In the modification illustrated in Figure 4, the number of electromagnets M or pairs of electromagnets used in connection with the master record corresponds to the number of records L which are to be reproduced from the master record.

65 According to a further modification as il-

lustrated in Figure 5, the image reproducing apparatus P and the sound reproducing apparatus Q are caused to act on an endless band R of magnetic material, a series of image and sound reproducing apparatus, S and T respectively, being simultaneously used for reproducing the images and the sound and an additional electromagnet U energized by a battery  $u$  being employed for wiping out the magnetic impressions after they have operated the various reproducing apparatus S and T.

I wish it to be understood that the various details for carrying the invention into effect may be modified in various respects without in any way departing from the spirit of the invention.

What I claim is:

The combination with a recording device having a travelling magnetic member, and electro-magnetic means associated therewith, of a photo-electric cell comprising a thermionic tube, a mechanically vibrating device within said tube, said device being adapted to vibrate in two directions at right angles to one another, and having one end fixed, a photo-electrically sensitized surface disposed on the other end of said tube and an electric circuit including a source of supply, said photo-electric cell, said electro-magnetic means and an amplifier.

In testimony whereof I have signed my name to this specification.

BORIS RTCHEOULOFF.