Sept. 4, 1928. 1,683,451

L. DE FOREST

SOUND RECORDING AND REPRODUCING APPARATUS

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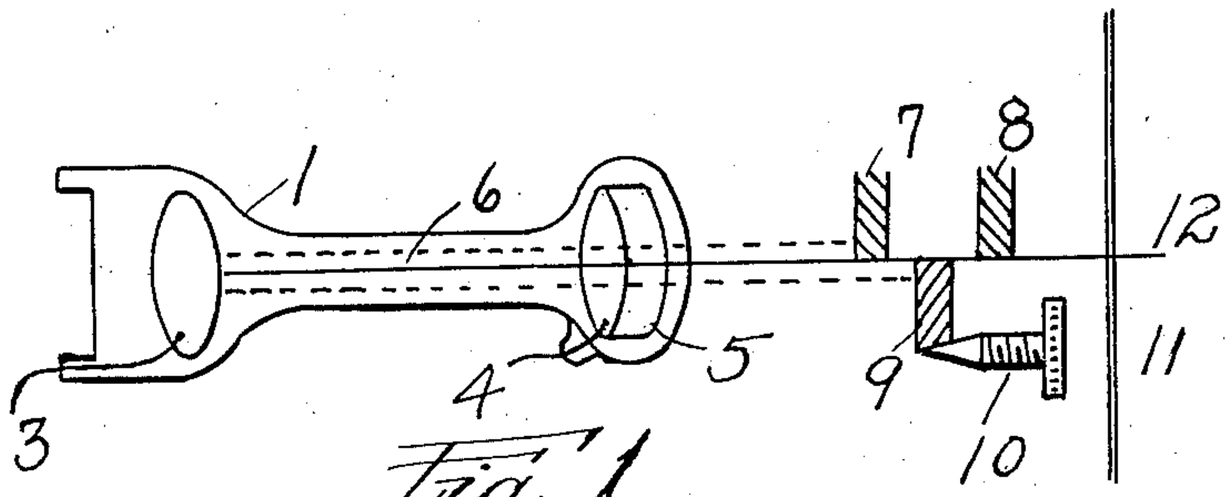


Fig. 1


Fig. 2


Fig. 3

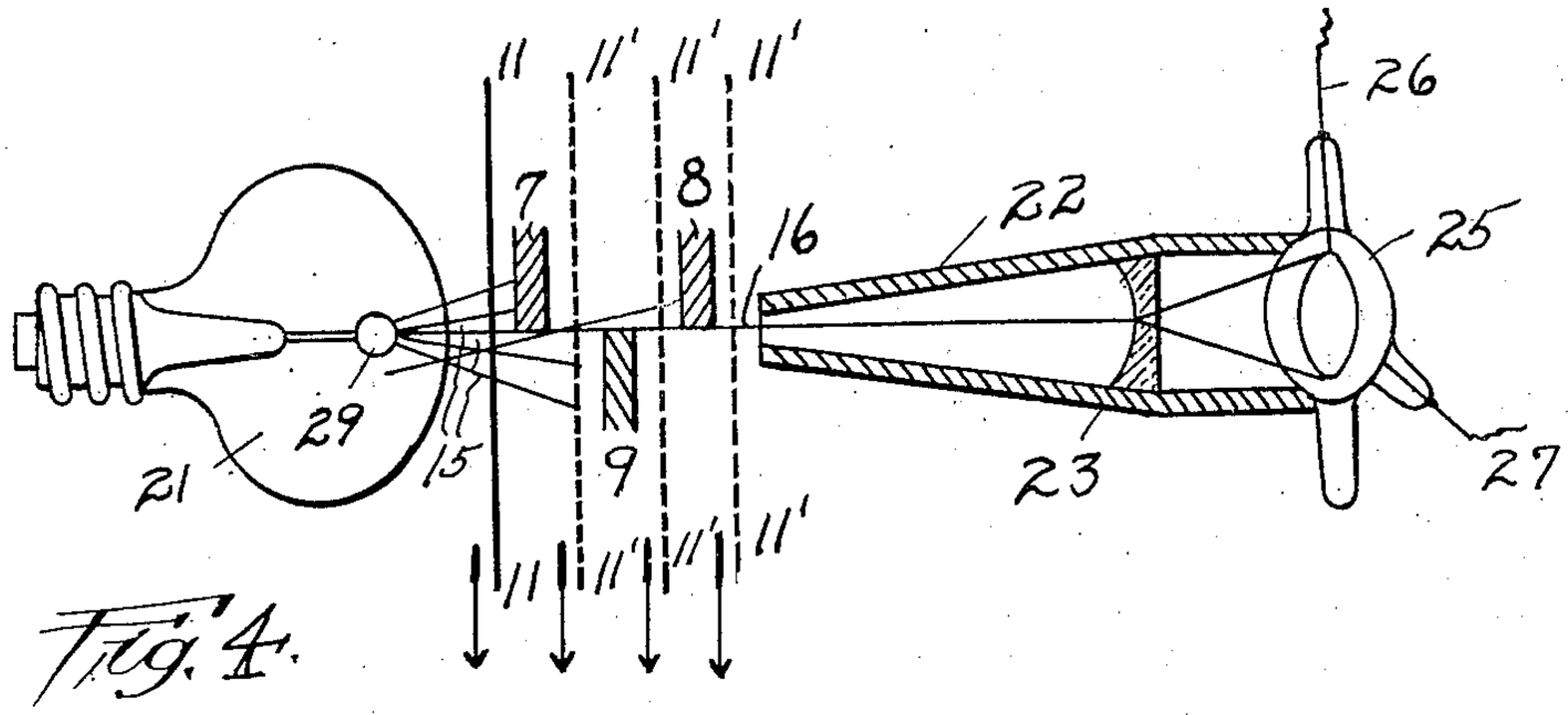


Fig. 4.

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# UNITED STATES PATENT OFFICE.

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## SOUND RECORDING AND REPRODUCING APPARATUS.

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This invention relates in general to apparatus for recording sound photographically, and means for reproducing the recorded sound.

More specifically this invention resides in means for controlling the form and characteristics of the light emitted from sound controlled light emitting devices.

It is one of the purposes of this invention to provide means whereby the thickness of the light band impinging upon the sensitized film may be readily controlled without distorting the sound waves to be recorded.

This invention resides substantially in the combination, construction, arrangement and relative location of parts as will be more fully described hereinafter.

Referring to the drawings, in which the same reference numerals will be used throughout the several views to indicate the same or similar parts,

Fig. 1 represents a side elevational view partly in section, of the apparatus of my invention.

Fig. 2 represents a detail.

Fig. 3 is a plan view of the members used to form the very fine slit.

Fig. 4 is a side elevational view, partly in section, of my novel slit forming members used in connection with sound reproducing devices.

In the phonofilm art it has been rather difficult to produce a sound-influenced light in the proper form. In order that sound recording and reproducing devices may record and reproduce sound waves accurately, it is necessary that the light impinging upon the sensitized film be in the form of a very fine thin line; and many attempts have been made to produce apparatus which will cause the light to take this form. By my device, I am able to produce a thin beam of light of any desired thickness.

In Fig. 1, 1 represents a photion or other light producing device which projects from it a light band 6. The terminals 3 and 4 are intended to be connected in the circuit of the sound reproducing apparatus in the well known manner. The light band 6 impinges upon three opaque members 7, 8 and 9, lying in separate parallel planes the member 9, having one edge opposed to the edges of the other members 7 and 8 so that in viewing them from the side as in Fig. 3, they form a very narrow slit 2. The member 9 is adjustable in its position relative to the other two members through the agency of a set screw 10 having a conical end. It will thus be seen that the relatively wide band of light 6 as it impinges upon the slit forming members is cut off so as to form a very thin band of light 12, appearing as a fine line in cross-section. This band of light will vary in intensity by and in accordance with the variations in the circuits connected to the terminals 3 and 4, which are in turn produced by and in accordance with variations in the sound waves impinging upon the microphone or sound recording device. This light, varying in intensity, impinges upon a sensitive film 11 where it is permanently recorded in a well known manner. By mounting the opaque members 7, 8 and 9, in thin parallel planes, there is no line of light, due to the diffraction and multiple reflection of the beam as it passes through the plates. If the plates should be placed in the same plane with the edges directly opposing each other, practically all of the light would be absorbed in the space between them through diffraction and multiple reflection but by my arrangement this difficulty is eliminated. By this arrangement, I am able to obtain on the surface of the photographic film 11 an exceedingly narrow and sharply defined plane beam of light 12 with greater efficiency than when the beam of light is passed through any conventional type of slit. At the same time, the light limiting devices 7, 8 and 9 may be placed a suitable distance away from the film 11 as it travels at right angles to the light, thus eliminating any possible abrasion of the film surface.

In Fig. 4 I have shown a similar arrangement as applied to a projecting machine for reproducing sound from moving photographic film. The light emitting instrument 21 which may be of a relatively large horizontal filament or other light producing element 29, projects a steady beam of light through the travelling film 11 on which the sounds to be reproduced are recorded The quantity of light passing through the sound record varies depending upon the density of the record and the light which is transmitted through the film is cut off as in Fig. 1 by means of the plates 7, 8 and 9, so as to be confined to a relatively plane beam of light 16. This beam of light enters an opaque, box-like structure 22, and impinging upon a diffusing

lens 23, spreads out over a light sensitive cell 25. The terminals 26 and 27 of the light sensitive cell are connected in the usual and well known manner to sound amplified and reproducing devices to convert the electric currents into sound waves. As shown in Fig. 4, the dotted lines 11′, 11′ represent other positions which the film 11 may assume, without materially impairing the results of the reproduction, with respect to the members 7, 8 and 9, while confining the light transmitted to the sensitive cells to a thin plane band and cutting off any extraneous and undesirable rays from influencing the light cell.

I am, of course, aware that many modifications in details of construction and arrangement of the parts of my invention may be made by one skilled in the art without departing from the spirit and scope of my invention, and I do not, therefore, desire to be limited to the specific embodiments shown and described by me but rather to the limits defined by the appended claims.

Having now described my invention, what I seek to secure by United States Letters Patent is:

1. In a device for photographically recording and reproducing sound waves, a source of illumination, and means comprising three straight edged opaque bodies lying in separate parallel planes to permit an extremely thin plane of light through the edges of two of said members lying in the same plane.

2. In a device for photographically recording and reproducing sound waves, a source of illumination and means comprising a plurality of at least three opposed plane surfaces at least one of which is adjustable with respect to the others to pass light in a thin line the edges of the other of said members lying in the same plane.

3. In a device for photographically recording and reproducing sound waves, a source of illumination, and means comprising a plurality of opaque bodies lying in separate planes with opposed edges to pass light in a thin plane.

4. In a sound reproducing and recording device, a source of illumination, means comprising a plurality of at least three relatively wide opaque bodies disposed with thin edges opposed to pass light without diffusion in a plane, and means for recording variations in intensity of said source.

5. In a sound reproducing and recording device, a source of illumination, means comprising three opaque plane members two of which lie in separate parallel planes on one side of the center line of the light source, and a third member on the opposite side in a plane between the other two, said third member being adjustable with respect to the other two, and the other two members having thin edges in the same plane to vary the thickness of the beam of light passed, and means for recording variations in intensity of said source of light.

6. In a sound reproducing and recording device, a source of illumination, means comprising three opaque plane members two of which lie in separate parallel planes on one side of the center line of the light source, and a third member on the opposite side in a plane between the other two, said third member being adjustable with respect to the other two, to vary the thickness of the beam of light passed, means for recording variations in intensity of said source of light and means for diffusing the said thin beam of light.

In testimony whereof I have hereunto set my hand on this 10th day of December, A. D., 1925.

LEE DE FOREST.