Dec. 14, 1937. S. S. HANSEN ET AL 2,101,940

OSCILLOGRAPH

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Fig. 1

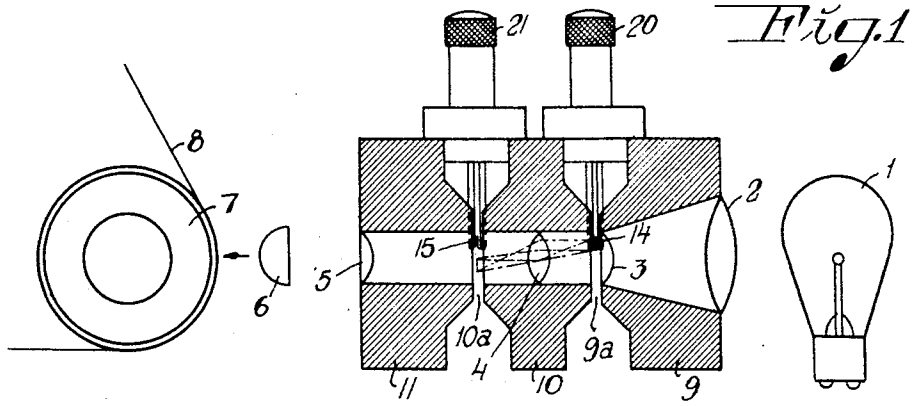


Fig. 2

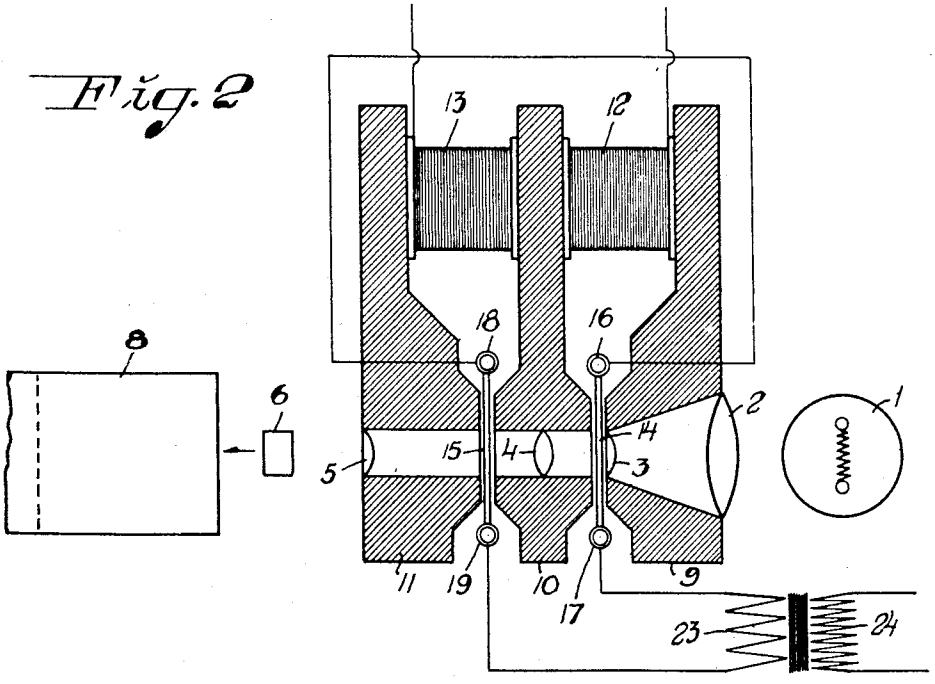
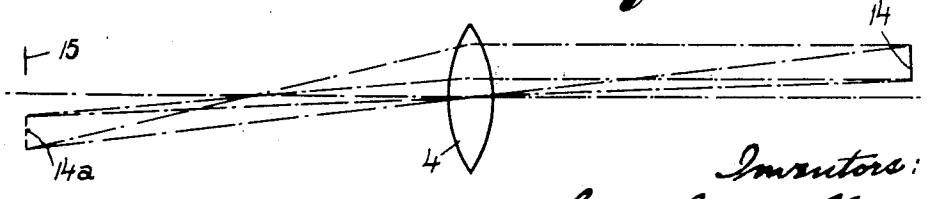


Fig. 3



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OSCILLOGRAPH

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6 Claims. (Cl. 88—61)

The present invention relates to oscillographs of the type used in recording pictures representing sound on a film, and more particularly to the type in which a beam of light rays is varied with regard to its cross section or its intensity by a diaphragm or light intercepting system which is actuated in accordance with the sound to be recorded.

In such oscillographs heretofore known a diaphragm has been provided in the form of a strip or string of conducting material in the path of the rays of light and in a magnetic field the strip being passed by the current representing the sound or the so-called microphone current. The variations of the current due to the sound variations cause a varying action corresponding thereto of the magnetic field on the strip, and as a result the strip will be displaced relatively to the path of the rays so that the travelling film will be exposed in a varying manner correspondingly.

It was found that a certain distorsion of the sound may arise in reproducing which may be explained by the fact that when vibrating in timed relation to the variations of the microphone current the diaphragms move in a certain moment in the same direction as the travelling film and in the next moment in the opposite direction. It has been proposed, in order to avoid said disadvantage, to use two strips extending parallel to each other and moving in timed relation to the sound variation towards and away from each other whereby they more or less cover the small slot passed by the rays of light. However, such a construction also suffers from certain disadvantages, partly of mechanical nature and partly of electric nature. As a matter of fact it sometimes occurs that said extremely thin strips are overloaded and as a result break. Mounting in stead of the failed strips two new strips arranged in the form of a coil is extremely difficult due to the little space available. As a result interruptions may arise which may injuriously affect the film production. The other disadvantage consists in that due to the proximity to each other the strips may have electrostatic or inductional influence on each other and, as result, cause distorsion.

The disadvantages mentioned above are avoided in accordance with the present invention by providing the diaphragms cooperating optically and formed as strings, strips, fillets or the like in spaced relation to each other in the direction of the rays of light, and in separate magnetic fields. The distance between the strips or the like is suitably greater than at least the width of the strip or the diameter of the string. Preferably said distance is at least 10 times greater than said width or diameter.

The invention may be used not only in the system mentioned above and in which the diaphragms cover, to a various extent, a slot through which a beam of rays having constant intensity is passing so as to vary the cross section of the beam of rays, but it may also be applied to systems of the type in which the intensity of the beam of light is varied by means of the strips. In the latter case it may be supposed that the strips or strings may carry portions of a transparency decreasing uniformly so that the beam of light will weaken more or less as said portions cover each other or are in registry to a greater or smaller extent. Furthermore, the slot of light and also the strips may have special form or different positions relatively to the travelling film. Finally the magnet strip system may also be reversed as for instance by providing the strips which may also be connected in parallel or in series so as to be passed by a constant current, the magnetic system being provided with coils passed by the currents representing the sound to be recorded.

A preferred embodiment of the invention is shown in the accompanying drawing, in which

Figure 1 is a side elevation of a recording apparatus shown partly in section,

Figure 2 is a sectional plan view thereof in which a circuit of current is shown, and

Figure 3 shows the path of rays through a lens on an enlarged scale.

Similar reference characters indicate corresponding or similar parts in the different figures.

A beam of light is ejected from a source of light 1 having a constant intensity, and passes a collecting lens system 2, 3 and further lens means 4, 5 and 6 in the direction indicated by the arrow towards a roller 7 passed at the circumference by the film 8 on which the sound, i. e. the pictures representing the sound in the form of dark and light portions is to be recorded. With the exception of the lens 6 all lenses are mounted, in accordance with the invention, in bores arranged for the purpose in pole pieces 9, 10, 11 of a double electro-magnet. Between each pair of legs of the magnet there are positioned coils 12 and 13 respectively. Said coils are fed by a constant current at a constant potential. The said magnets may be substituted by permanent magnets if desired. In the air gaps 9a and 10a respectively between the pole pieces 9 and 10 or between 10 and 11 respectively there is a

string or a strip 14 and 15 respectively having a rectangular cross section, the longer sides of the rectangle being at right angles to the axis of the lens system, i. e. at right angles to the rays. The ends of each strip are secured to a support 16, 17 and 18, 19 respectively. Said supports are connected to a screw device 20 and 21 respectively by means of which the strips 14 and 15 respectively may be stretched. The supports 16 and 18 are connected to each other by means of a conductor 22 whereas the supports 17 and 19 are connected to a coil 23 coupled inductively to a coil 24 passed by the microphone current. The strips 14 and 15 are mounted in air or oil gaps 9a and 10a respectively at a level above the rays as shown in Figures 1 and 3 so that when the current is passing the strips the latter will be pulled down. In this connection it may be supposed for instance that the central pole 10 is a magnetic north pole, the two outermost poles 9 and 11 being magnetic south poles. Thus the two strips would screen the beam of rays only at the top portion thereof. However, since the lens 4 is introduced between the strips an image 14a of the strip 14 will be positioned at the bottom of the beam of rays opposite the real strip 15. As the strip 14 is now moving downwards the image or shadow thereof 14a will move upwards so that the strip 15 and the image 14a of the other strip 14 are cooperating with each other in optical respect as desired, the real strips 14 and 15 being prevented from influencing each other mechanically or electrically. According to a modified form of construction the lens 4 may also be applied in the pole piece 11 in which case one of the strips as for instance 14, must be positioned below the beam of light and the magnetic system 9, 10, 12 reversed to move the strip 14 upwardly as the strip 15 moves downwardly and vice versa.

The entire recording apparatus or at least the film apparatus with the lens 6 is conventionally enclosed in a light-tight camera.

The term "ribbon", as used in the following claims is to be understood as including strips of rectangular cross-section, strings or wires of circular or other cross-section, fillets and other forms of elongated vibratory light intercepting elements.

What we claim is:—

1. In a light valve for recording sound on a film, a source of light, two light intercepting or screening elements adapted to oscillate in accordance with the sound to be recorded, separate magnetic fields for said elements, and means to form an image of one element substantially in the plane of the other element, whereby one element and the image of the other form a light slot for controlling a beam of light from said source.

2. In a light valve for recording sound on a film, a source of light, two light screening elements disposed in spaced relation to each other in the direction of the rays of light from said source and adapted to oscillate in accordance with the sound to be recorded, separate magnetic fields for actuating the individual elements, and means to form an image of one element to cooperate with the other element to form a light slot.

3. In an apparatus according to claim 2, wherein said elements are ribbons spaced apart by a distance from each other greater than the maximum dimension of the ribbon as measured in the plane of the path of light.

4. In an apparatus according to claim 2, wherein said elements are ribbons spaced apart by a distance of the order of not less than 10 times the maximum transverse dimension of the ribbon.

5. In a light valve for recording sound on a film by means of a beam of light, two ribbons adapted to oscillate in accordance with the sound to be recorded, said ribbons being disposed in spaced relation to each other in the direction of the beam of light and at the same side of the light beam, and an image inverting lens between said two ribbons to form an inverted image of one of said ribbons to cooperate with the other ribbon to form a light valve.

6. In a light valve for recording sound on a film by a beam of light, electromagnets connected to a source supplying constant current at a constant potential, a light screening ribbon disposed in the field gap of one of said electromagnets and another light screening ribbon in a field gap of another electromagnet, a coil supplying a microphone current to said ribbons, and means to form an image of one of said ribbons to cooperate with the other ribbon, whereby a light slot is formed between said image and said other ribbon.

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