

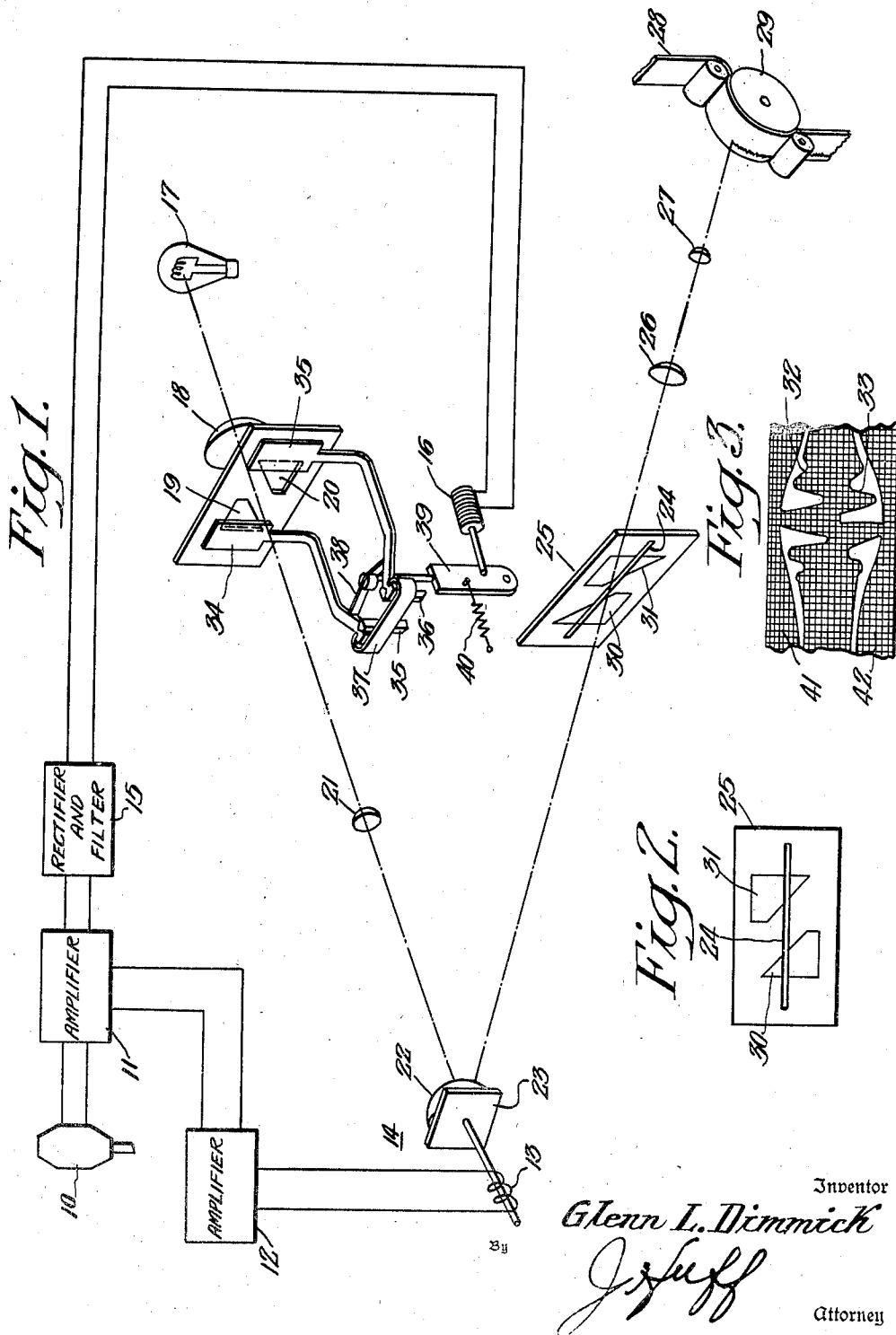
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SOUND RECORDING SYSTEM

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2,154,067

SOUND RECORDING SYSTEM

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3 Claims. (Cl. 179—100.3)

This invention relates to sound recording systems wherein a light beam modulated in accordance with the audio frequency impulses to be recorded is applied to the surface of a light-sensitive film or the like. It has for its principal object the provision of an improved apparatus and method of operation whereby the background noise incident to the reproduction of sound from such a record is minimized or avoided.

More particularly, the invention relates to the production of what is known in the art as a "Class A" push-pull sound record. Such a record consists of a pair of similar sound tracks which are spaced from one another and are displaced in phase by 180 degrees. This type of record is broadly covered by Patent 1,833,373 granted to R. J. Pomeroy on November 24, 1931, and assigned to the same assignee as the present application. A method of producing this type of record by means of a galvanometer type of recorder is disclosed by Patent 1,879,423 granted to J. Neale on September 27, 1932, which is similarly assigned. As disclosed in my copending application Serial No. 47,968, filed November 2, 1935, for "Recording of sound", this record may also be produced by means of a light-beam having the form of a parallelogram offset to space its ends from one another along the length dimension of a light slit across which it is vibrated in response to the impulses to be recorded. None of the aforesaid inventions, however, involve the provision of means for minimizing the reproduced background noise which results from the transmission of light through the unused transparent area of the sound record or track and becomes especially objectionable in the case of reproduced sound of low volume.

It has been proposed to minimize such background noise in various ways, such as by applying to a recording galvanometer winding or the operating winding of a shutter a bias potential which varies as the envelope or volume of the recorded impulses. The present invention involves the use of a pair of shutters which are operated in accordance with the volume of the recorded sound to vary the sizes of a pair of oppositely disposed trapezoidal light beams which are vibrated transversely of a light slit in accordance with the impulses to be recorded. Thus, when the volume of impulses is low, the size of the trapezoidal recording beams is relatively small, and vice versa.

The sectional areas of the trapezoidal beams are preferably in the form of a parallelogram on which a triangle is superimposed, the beams be-

ing spaced apart to prevent mixing of the sound tracks and the parallelogram base extensions serving to prevent the light beams from entirely leaving the slit in case of overshooting. Otherwise stated, the light beams are in the form of the displaced halves of a diagonally divided parallelogram.

With respect to the type of shutter utilized, the present invention is similar to that disclosed by a copending application of Judd O. Baker et al., Serial No. 82,596, filed November 29, 1936, for "Photo-phonographic apparatus" and assigned to the same assignee as the present application. The present invention, however, differs from that of the aforesaid Baker et al. application in that it utilizes differently shaped light beams and results in an improved and altogether different type of sound record.

The invention will be better understood from the following description when considered in connection with the accompanying drawing and its scope is indicated by the appended claims.

Referring to the drawing

Figure 1 is a diagrammatic illustration of a recording system embodying the invention,

Figure 2 illustrates a detail of the system of Fig. 1, and

Fig. 3 illustrates the type of sound record produced by the system of Fig. 1.

The system of Fig. 1 includes a sound pick-up device, such as a microphone 10, from which the impulses to be recorded are supplied through amplifiers 11 and 12 to the operating coil 13 of a recording galvanometer 14 of any suitable type and from which a potential dependent on the intensity or volume of the recorded impulses is applied through the amplifier 11 and a rectifier and filter 15 to a shutter operating winding 16. From a light source shown as a lamp 17, light is transmitted through a lens 18, oppositely disposed trapezoidal apertures 19 and 20 and lenses 21 and 22 to the galvanometer reflector or mirror 23. Light is reflected from the mirror 23 through the lens 22, the light slit 24 of a mask 25 and lenses 26 and 27 to the surface of a light sensitive strip 28 which may be a motion picture film arranged to be moved in contact with a rotatable recording drum 29.

Under these conditions, there is produced at the mask 25 trapezoidal light spots 30 and 31 which are images of the apertures 19 and 20 and which may be vibrated transversely of the slit 24 by means of the galvanometer 14 to produce two similar sound records 32 and 33 (Fig. 3) displaced in phase by 180 degrees. It will be noted that

the apertures 19 and 20 are so disposed with respect to one another that their images 30 and 31 are slightly displaced from one another along the length dimension of the slit 24. This spacing of the images is advantageous in that it prevents overshooting of either of the sound tracks into the path of the other sound track. The parallel-ogram shaped base portions of the beams, of course, ensure that high amplitude vibrations do not remove the beam completely from the slit, thus producing clicks in the reproduced sound.

Cooperatively associated with the light apertures 19 and 20 are a pair of shutters 34 and 35 which are pivoted to supports 35 and 36 by means of resilient members or springs 37 and 38 and are operated through the solenoid 16, and a member 39, which is fixed to the spring 38 at its upper end, is biased against the pull of the solenoid 16 by a spring and may be suitably pivoted at its lower end.

As will be apparent without detailed explanation, the shutters 34 and 35 are moved in opposite directions to cover more or less of the corresponding apertures 19 and 20 depending on the volume of the recorded sound. Thus, if the volume is low, the vibrational amplitude of the images 30 and 31 is relatively short and the shutters 34 and 35 are moved relatively close together so that a minimum area of sound track is exposed. As the volume of the recorded sound increases, the shutters are moved further apart to avoid clipping of the record peaks producing in the positive record of Fig. 3 the shaded areas 41 and 42. As in previous methods of noiseless recording by means of a shutter, a minimum of trans-

parent record area is thus maintained throughout the entire volume range of the recorded sound.

I claim as my invention:

1. In an impulse recorder including a light slit, means for producing a light beam and means for vibrating said beam across said slit in accordance with impulses to be recorded, the combination of means forming a pair of oppositely disposed trapezoidal apertures arranged to define the shape of a pair of such beams, and shutter means operable to vary the size of said apertures in accordance with the volume of said impulses.

2. In an impulse recorder including a light slit, means for producing a light beam and means for vibrating said beam across said slit in accordance with impulses to be recorded, the combination of means forming a pair of oppositely disposed trapezoidal apertures arranged to define the shape of a pair of such beams, and a pair of shutters operable in opposite directions to vary the size of said apertures in accordance with the volume of said impulses.

3. In an impulse recorder including a light slit, means for producing a light beam and means for vibrating said beam across said slit in accordance with impulses to be recorded, the combination of means forming a pair of spaced apart and oppositely disposed trapezoidal apertures arranged to define the shape of a pair of such beams, and shutter means operable to vary the size of said apertures in accordance with the volume of said impulses.

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