

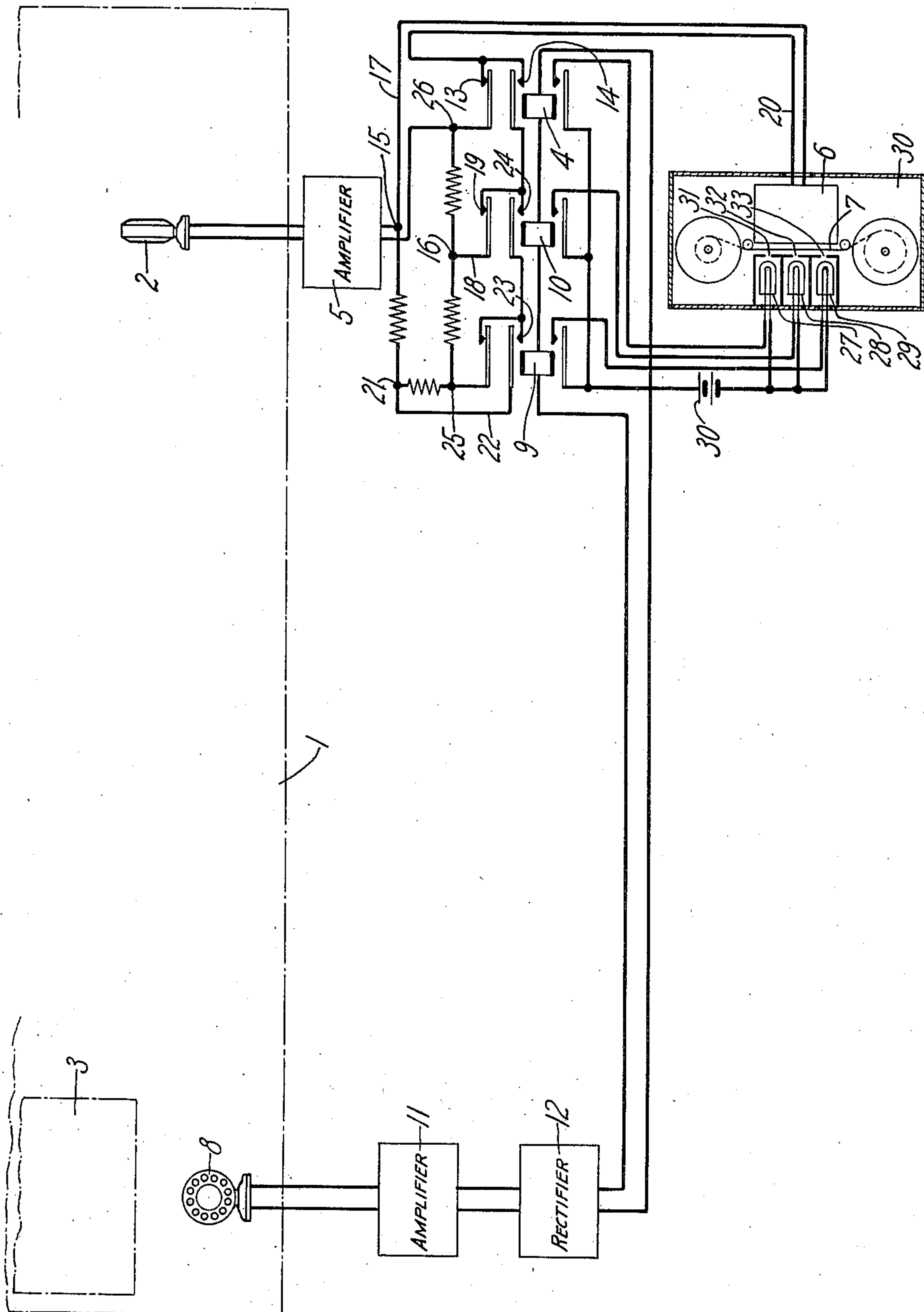
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SOUND RECORDING SYSTEM

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SOUND-RECORDING SYSTEM

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This invention relates to sound recording systems and more particularly to methods of volume control for such systems.

It is well known in the art that when a record of sound is made on a wax disc or a photographic film, the range of intensity that can be recorded and successfully reproduced is limited on one side by amplitude distortion and on the other by the inherent irregularities in the recording medium which gives rise to the "scratch" during reproduction. In order to increase this range of volume, various methods have been suggested for reducing the amplification during recording when the intensity is high, and increasing it when the intensity is low. The amplification in reproducing is then correspondingly decreased and increased in order to reproduce the sound at the original intensities.

The satisfactory operation of such arbitrary methods, however, requires that an operator shall anticipate changes of intensities and thereby prevent the record capacity from being exceeded. It is the general object of this invention to accomplish this result automatically.

Accordingly it is proposed that the recording be done in a large properly damped room. The sound source and the pick-up microphone are placed at opposite ends of the room and the time delay in the arrival of the sound waves at the microphone thereby introduced, permits the gain in the recording circuit to be varied by the pick-up of a second microphone located near the sound source, before the corresponding changes in the sound currents occur.

In the drawing 1 is a recording studio which has been sufficiently damped to permit the sound pick-up device 2 to operate satisfactorily at a distance from the sound source 3. With relay 4 in the position shown, the sound currents will be amplified by amplifier 5 impressed upon the light valve 6 and recorded on the film 7 in the usual manner.

However, due to the unusual distance (which is preferably about 40 feet) between the sound source and the pick-up device, the sound currents will lag behind the vibrations of the sound source by about $1/25$ of a second.

While the sound is being recorded the pick-up of the control microphone 8 is energizing fast operating marginal relays 9, 10 and 4 through amplifier 11 and rectifier 12. The amplification of amplifier 11 is adjusted so that relay 4 operates when the sound intensity is about to exceed the capacity of the recording film. Accordingly, almost simultaneously with the increase of sound intensity above a predetermined level, relay 4 will attract its armatures to open the recording circuit at contact 13 and reclose it at contact 14. The light valve is then no longer connected across the entire potentiometer for its circuit is now traced from terminal 15 and conductor 17 and terminal 16, conductor 18, contacts 19 and 14 and conductor 20 to the light valve 6.

Due to the delayed arrival of the sound currents at the main pick-up microphone, the circuit just traced will have been completed by the time the sound currents of increased intensity reach the potentiometer, so that the recording current is not permitted to exceed the predetermined upper limit. A further increase in sound intensity will result in the operation of relay 10 and finally of relay 9 if the sound becomes extremely loud. In this extreme case the recording circuit is traced from terminals 15 and conductor 17 and terminal 21, conductor 22, contacts 23, 24, 14 and conductor 20 to the light valve 6.

Conversely, as the sound intensity decreases relays 9, 10 and 4 will be successively released and the recording light valve connected to terminal 25, 16 or 26 respectively to prevent the sound currents from falling below a predetermined minimum value.

In order that the record so made may be reproduced at the proper relative intensity throughout, some such marking devices as lamps 27, 28 and 29 may be provided in the recorder. In the arrangement shown the lamps are related to marginal relays 4, 10 and 9 respectively and are connected to the lower armature of the relay in each case as shown. Whenever a relay is operated its corresponding lamp is lighted by battery 30 and remains lighted as long as the relay is operated. Light from these lamps exposes

the film through small apertures 31, 32 and 33 which are slightly displaced laterally from each other, and leaves a line or lines upon the film to one side of the sound record in accordance with the amount of volume compression introduced.

The reproducer would then be provided with a relay operated potentiometer for introducing in the reproducer circuit proper amounts of gain to compensate for the losses occurring in the recording potentiometer. The relays of this potentiometer could be controlled by contact devices operating through perforations in the film where the markings occur or by light sensitive cells responsive to the variations of light beams caused by the film markings when the beams are projected through the film.

The present invention has been illustrated by a specific method of volume control but obviously many modifications might be made without departing from the spirit and scope of the invention defined in the following claims.

What is claimed is:

1. In a sound recording system, a recording surface, a source of sounds to be recorded, a pick-up device at a distance from the source for translating the sounds into corresponding electric currents, a recording circuit, and monitoring means responsive to the sounds for varying the gain in the recording circuit automatically in anticipation of changes in the amplitude of the currents from the pick-up device and for marking the recording surface at intervals only in accordance with the gain variations.

2. In a sound recording system, a recording surface, a source of sound, a pick-up device at a distance from the sound source for translating the sounds into electric currents, a second pick-up device near the sound source, recording means including a recording circuit, and means responsive to the second pick-up device for varying the gain in the recording circuit and marking the recording surface at intervals only in accordance with the gain variations.

In witness whereof, I hereunto subscribe my name this 3rd day of February, 1928.

EDWARD C. WENTE.

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