Nov. 22, 1932. W. A. MUELLER 1,888,467

SOUND RECORDING

Filed May 16, 1932

Fig 1

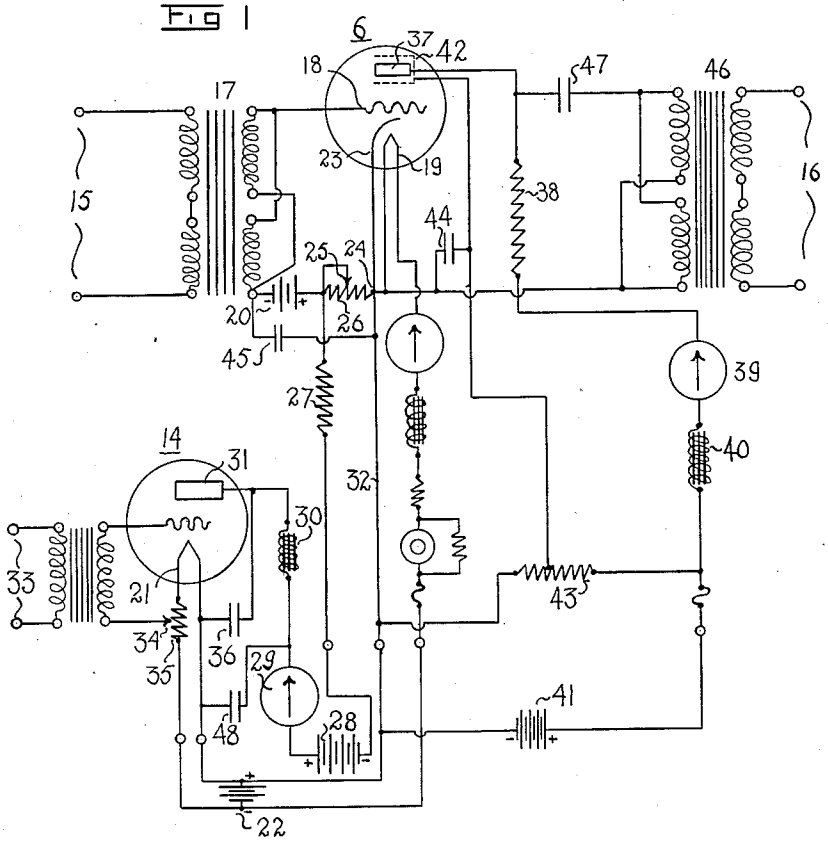
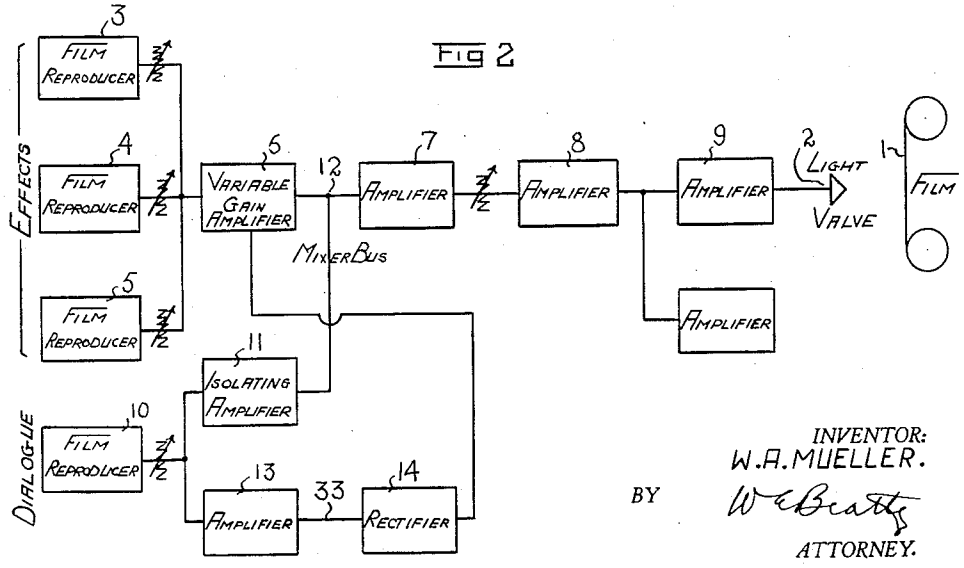


Fig 2



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SOUND RECORDING

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This invention relates to the art of recording sound and more particularly to the rerecording, or duping of a variety of sounds from a plurality of sound records onto a master record in such a manner that these varied sounds are correlated and form a pleasing whole.

In making a sound picture where background noises such as music, the rumble of traffic, or the chatter of a crowd are to be combined with spoken dialogue, it is necessary to maintain a proper balance or tone level between the two components so that the dialogue will always be intelligible and at the same time the background effects will be life-like and real.

At the present time, this is accomplished manually by an operator who controls a mixing panel equipped with means for varying the level of the sound effects in relation to the spoken dialogue. As will be easily understood, it is impossible by this method to constantly maintain an even balance so that the effects are strong enough to be life-like and the dialogue still intelligible; for when the effects are reduced in level so that the dialogue may be understood, they no longer sound real, and vice versa, if the effects are too strong, the dialogue cannot be understood.

The operator compromises by attempting to reduce the effects a correct amount when dialogue is being spoken, and by raising the level of the effects when there is no dialogue. The manual control is inaccurate however, both as regards changing the volume a desired amount and as regards changing the volume at the proper instant. In other words, the "sound effects" recording channel cannot be controlled fast enough by hand to accurately follow the rapid variations in the intensity and duration of the dialogue currents. The best dramatic effects cannot be secured however, if there is the slightest discrepancy in the correlation of the sound effects and the dialogue.

The above mentioned difficulties have been overcome by the present invention by providing an arrangement whereby the degree of recording of the sound effects is varied automatically and instantaneously in accordance with the dialogue, the degree of recording of the sound effects being reduced as the intensity of the dialogue increases. This gives rise to new and surprising results as follows:

On listening to the reproduction of a record made in accordance with the above arrangement and wherein an orchestra serves as the sound effects, one has the impression that the orchestra is playing all the time at full volume, in spite of the fact that the dialogue is always intelligible. This results from the fact that there is no delay between the cessation of the dialogue and the restoration of the orchestral reproduction to normal volume and furthermore, the dialogue currents instantly suppress the volume of the orchestra a desired amount so that the dialogue is always intelligible above the music of the orchestra.

For further details of the invention, reference may be made to the drawing, wherein:

Fig. 1 is a diagrammatic view of a preferred compensating circuit.

Fig. 2 is a schematic view of a rerecording or duping channel embodying the circuit of Fig. 1.

Referring in detail to Fig. 2, there is to be recorded on the film 1, by means of a light valve 2, a proper proportion of dialogue and sound effects. For this purpose one or more film reproducers 3, 4, and 5 are provided to generate electrical currents according to desired sound effects, these currents of course reproducing sound waves recorded on the films of their respective reproducers. The reproducers 3, 4, and 5 are connected to the recorder 2 through a variable gain amplifier 6, and one or more amplifiers such as 7, 8, and 9. The dialogue currents are obtained from a film reproducer 10 which reproduces currents corresponding to the dialogue sound waves recorded thereon. The film reproducer is connected through an isolating amplifier 11 to the effects recording channel at the point 12. The film reproducer 10 is also connected through the amplifier 13 and the circuit shown in Fig. 1 comprises a rectifier 14 to the variable gain amplifier 6. The purpose of the isolating amplifier 11 is to prevent

current from the effects recording channel from being impressed on the amplifier 13. In other words, the grid of amplifier 11 is connected to the circuit from reproducer 10 and the anode of amplifier 11 is connected to the point 12.

While reference has been made above to reproducers 3, 4, 5, and 10 of the film type, it is obvious that they may reproduce from wax records instead, or in fact, microphones may be employed for original recording. Furthermore, a wax recorder may be employed instead of the light valve and film 1 and 2. Excepting for the controlled circuit from the amplifier 13 and rectifier 14 to the amplifier 6, the various amplifier arrangements are well understood.

In order that the intensity of the effects current may be automatically and instantaneously varied in accordance with the intensity of the dialogue currents, the gain of the amplifier 6 is automatically controlled by means of the rectifier 14 in accordance with the intensity of the dialogue currents, whereby the effects current respond to the intensity of the dialogue current. The manner in which this is accomplished will be described in connection with Fig. 1, wherein; 15 represents the circuit leading from one or more of the film reproducers 3, 4, and 5 and the circuit 16 represents the output circuit of the amplifier 6. Circuit 15 is connected to the grid circuit of amplifier 6 by transformer 17, secondary winding of which is connected between the grid 18 and the heater 19.

Amplifier 6 may be type UX–235 with a negative grid bias battery 20, of 3-volts. The heater 19 and also the cathode 21 of rectifier 14, are heated by a 12-volt battery 22, the cathode 23 being connected to one side of the heater 19 at 24 as shown. Between this common connection 24 and the battery 20 is connected a 10,000 ohm potentiometer 26 having a slider 25 for varying the amount of resistance in the grid circuit. Through the potentiometer 26 flows a rectified dialogue current derived from the output circuit of rectifier 14. In order to change the bias on amplifier 6 for this purpose, the potentiometer 26 is connected to the rectifier as follows: through a 100,000 ohm resistance 27 (employed to obtain the desired rectifier characteristic) battery 28, ammeter 29, choke coil 30, anode 31, cathode 21, line 32 to the other side of potentiometer 26.

The rectifier 14 as shown in Fig. 2 is connected over circuit 33 to the output circuit of amplifier 13. The input circuit of rectifier 14 includes a variable connection 34 to a resistance 35 in the circuit of filament 21. Connected to one terminal of choke 30 is a condenser 36, in shunt to the cathode 21 and anode 31; connected to the other terminal of choke 30 is a condenser 48 also in shunt to the cathode 21 and anode 31. The choke 30 with condensers 36 and 48 form a filter to prevent ripples in the rectified current from reaching the grid circuit of amplifier 6.

The anode 37 of amplifier 6 is connected through a 100,000 ohm resistance 38, meter 39 and choke coil 40 to the positive side of battery 41, which furnishes current for the tube 6. The negative side of battery 41 is connected to point 24 in the circuit of cathode 23.

In order to provide a positive potential of 22-volts on the shield grid 42, this electrode is connected to a suitable point in the 10,000 ohm resistance 43, which is connected in shunt to the battery 41. A condenser 44 is connected in shunt to the shield grid 42 and the cathode 23. Condenser 45 is connected in shunt to the battery 20 and potentiometer 26. Space current from battery 41 is prevented from flowing through the primary winding of transformer 46 by means of a condenser 47. The three condensers last mentioned may have a value of 1 MF.

With the type of tube mentioned for amplifier 6 and with the values above mentioned of the circuit elements, it has been found that when the current from rectifier 14 is zero or substantially less than .2 mils, the gain from amplifier 6 is 15 DB. Assuming that potentiometer has an effective volume of 10,000 ohms, if in the assumed case, the rectified current increases in value, it is found that the gain of amplifier 6 decreases as follows:

Rectified current mils	Gain DB
.2	14.0
.4	11.5
.6	9.0
.8	6.5
1.00	5.0

Assuming that potentiometer 26 is now adjusted to have an effective volume of about 6,500 ohms, the relation between the gain of amplifier 6 and the rectified current in the output circuit of rectifier 14 will be as follows:

Rectified current mils	Gain DB
.2	14.5
.4	12.5
.6	11.0
.8	9.5
1.00	9.0

The above arrangement therefore provides means for automatically and instantaneously varying the degree of recording of the effects currents in accordance with the dialogue currents.

It will be apparent that various changes may be made in the above circuit arrangement without departing from the spirit or scope of the appended claims.

I claim:

1. The method of recording, which comprises simultaneously actuating a recorder from a plurality of recording channels and in controlling the recording effect of one of said channels in response to another recording effect in another channel.

2. The method of rerecording which comprises simultaneously translating a plurality of sound records into corresponding electrical currents respectively, recording the combined effects of said currents and in controlling one of said currents in accordance with another thereof.

3. The method of recording dialogue and sound effects in balanced relation which comprises simultaneously recording said dialogue and said sound effects and in controlling the volume of said sound effects instantaneously in accordance with the volume of said dialogue.

4. An arrangement for recording sound, comprising a plurality of recording channels, a recorder controlled thereby and means actuated by one of said channels for controlling another thereof.

5. An arrangement for recording sound, comprising a plurality of recording channels, a recorder controlled thereby and means responsive to the intensity of the recording effect in one of said channels for controlling another recording channel.

6. An arrangement for recording sound, comprising a recording channel, an amplifier therefor, a second recording channel, a recorder controlled by said channel, and means responsive to the condition of said second recording channel for controlling the effectiveness of said amplifier.

7. A recording arrangement comprising the combination of a plurality of recording channels, a recorder therefor and a rectifier responsive to one of said channels for controlling another channel.

8. A recording circuit comprising the combination of a plurality of recording channels, an amplifier in one of said channels and means for decreasing the gain of said amplifier in response to an increase in the recording effect in another of said channels.

9. The combination of a plurality of recording circuits, a recorder therefor, an amplifier in one of said circuits and having a grid electrode and means responsive to the condition in one of said circuits for controlling the bias of said grid.

10. A rerecording circuit comprising a source of dialogue currents, a source of sound effects currents, means comprising a recorder for simultaneously recording both of said currents, and means responsive to said dialogue currents for automatically maintaining a balanced relation between said dialogue currents and said sound effects currents.

11. In apparatus for the rerecording of sounds, the combination of a plurality of recording circuits, a recorder therefor, a variable gain amplifier in one of said circuits, a rectifier in another of said circuits and connections from said rectifier to said amplifier.

12. A rerecorder comprising a plurality of recording circuits, a recorder therefor, a controlling device connected to one of said circuits for controlling another circuit and a unilateral device connecting said circuits together for preventing a plurality of said circuits from controlling said controlling device.

13. In apparatus for the recording of sounds, the combination of means for supplying electrical impulses corresponding to sound waves, an amplifier therefor, means for supplying other electrical impulses corresponding to sound waves, a rectifier therefor, means for recording said impulses and means responsive to said rectifier for controlling said amplifier.

14. In apparatus for the rerecording of sounds, the combination of a plurality of sources of electrical impulses corresponding to sound waves, a recorder therefor, a vacuum tube amplifier having a grid electrode associated with one of said sources, a rectifier associated with another of said sources, and means for increasing the potential of said grid electrode in response to an increase in the rectified current from said rectifier for decreasing the gain of said amplifier in response to an increase in the intensity of the source of electrical impulses which energizes the said rectifier.

In witness whereof, I have hereunto subscribed my name this 13th day of May, 1932.

WILLIAM A. MUELLER.