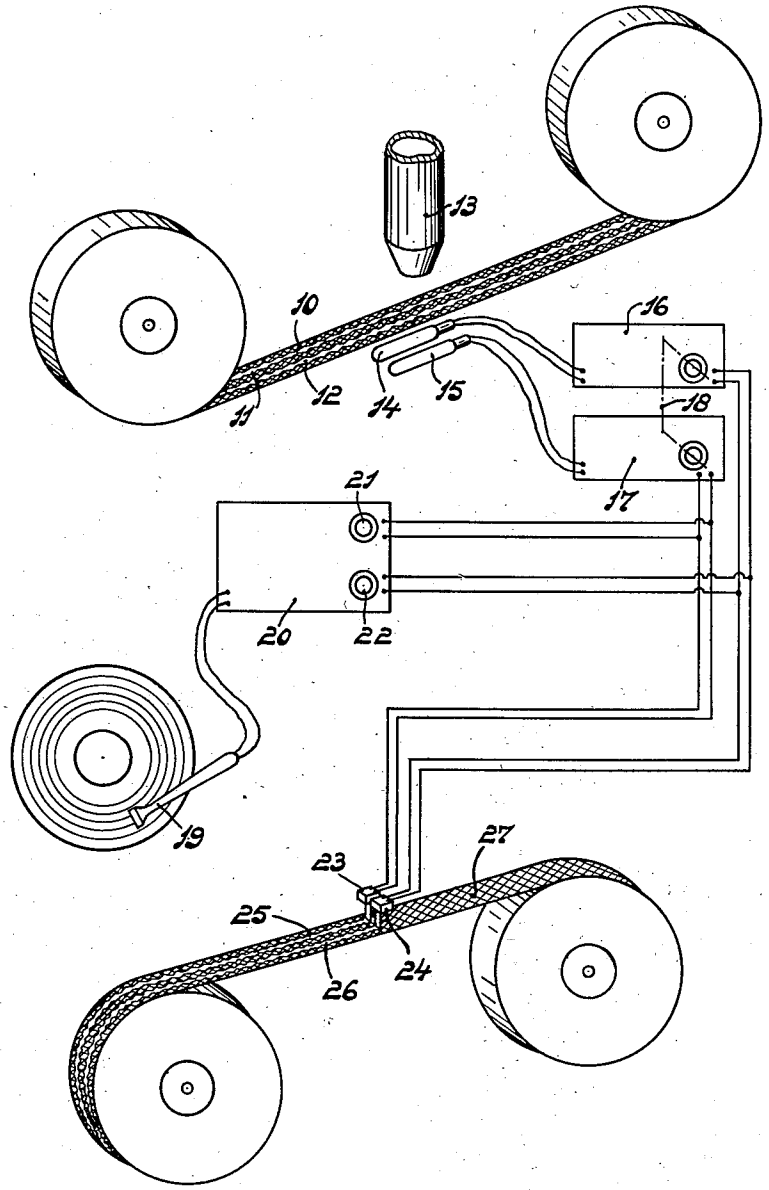
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METHOD OF MIXING SOUND RECORDS

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METHOD OF MIXING SOUND RECORDS

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In the case of stereophonic sound records at least two sound tracks are obtained from microphones or groups of microphones which are arranged at a slight distance from each other. The difference between these two sound tracks consists in a difference in both time and intensity. During reproduction by means of loudspeakers arranged similarly to the microphones the differences give the impression that the sound is not received from the loudspeakers but has a spatial effect and is independent of the position of the loudspeakers.

In the production of sound films it frequently occurs that a stereophonically-recorded sound record has to be mixed with a sound record which is not recorded stereophonically and is obtained from another source of sound. In the production of picture-plus-sound films this mixing method is frequently resorted to since it is not always possible for all the various sound records to be made stereophonically. Now, it is possible for this non-stereophonical record to be first reproduced and re-recorded stereophonically before being mixed. In this case the above-mentioned differences in time and intensity are brought about by artificial means but this method is comparatively involved and costly.

According to the invention, the non-stereophonic sound record is mixed with the stereophonic sound record by separately controlling the sound intensity of the non-stereophonically recorded sounds for each channel of the stereophonic record. The invention is based on recognition of the fact that the stereophonic effect is primarily due to the differences in intensity and that in the above mentioned mixing method sufficient approximation is obtained provided these differences are controlled.

It is preferable that the various channels of the non-stereophonic sound should include means for exciting a controllable artificial reverberation.

According to one embodiment of the invention the intensity of the sound fed to the various channels of the stereophonic sound record is controlled by reducing this intensity to zero in all channels but one.

In order that the invention may be clearly understood and readily carried into effect it will now be described more fully by reference to the example given in the accompanying drawing.

A carrier **10** is provided with two sound tracks **11** and **12** which are each produced by a separate microphone or a group of microphones and jointly constitute the stereophonic sound record. The sound film **10** is scanned, the two sound tracks being separately scanned in known manner, by means of a slit objective **13** and two photocells **14**, **15**. The resulting alternating currents are amplified by separate amplifiers **16** and **17**. These amplifiers are provided with electrically separated but mechanically coupled controlling means **18** so that the sound intensities of both sound channels can be controlled without disturbing the intensity ratio between the records.

Now assume that an existing non-stereophonic sound record is to be mixed with the stereophonically recorded sound. Such circumstance may occur in the production of a picture-plus-sound film if a stereophonic sound record made simultaneously with the picture has to be mixed subsequently with an existing record of, for example music, back-ground noise and so forth. The existing record might be mixed in the same intensity with the two channels of the stereophonic record. In the reproduction of such a record the admixed non-stereophonic sound would, however, be subjected to considerable distortion if listening did not ensue in a plane symmetrical to the loudspeakers since, due to the different path lengths between the loudspeakers and the point of listening, interferences would occur between the in-phase and equally intense sound waves. Moreover, the stereophonic sound would appear to come from a source separated from that of the admixed sound since in this case the latter has a constant direction.

In order to obviate this defect the sound intensity of the record to be admixed is, according to the invention, separately controlled for the various stereophonic channels. It is thus possible to impart to the admixed sound or noise an approximately stereophonic effect. Although correct stereophonic sound reproduction requires a difference in both intensity and time between the sound waves of the various channels it has been found that the binaural effect may be obtained to a satisfactory approximation by means of correctly chosen differences in intensity.

The sound record to be admixed is fed to amplifier **20** by a gramophone pick-up **19**. The said amplifier has two outputs each of which can be controlled separately by a voltage controller **21** and **22** respectively. The alternating voltages from each output are mixed with one of the channels of the stereophonically recorded sound and are re-recorded in two separate sound tracks **25** and **26** on another film **27** by means of separate recording devices **23** and **24**. If desired, reverberation can be artificially introduced into the sound reproduced by the pick-up **19**, and this often im-

proves the sound quality during reproduction. Since such devices for the production of artificial reverberation are known a more detailed description may be omitted.

Mechanical recording is indicated in the drawing for the last-mentioned recording operation but this and the shape and properties of the record carrier may be varied.

If it is not desired to go to the trouble of controlling the alternating voltages of two outputs for the non-stereophonically recorded sound sufficiently satisfactory results in reproduction may also be obtained if the intensity of the admixed sound has the value zero in one channel, i. e. when the sound to be admixed is mixed in only one stereophonic channel. In this case the amplifier 20 may be constituted by an amplifier having one output only.

The sound records obtained by the above-described method can be distinguished from the well-known multi-track records with stereophonic recording in that the sound tracks contain:

(*a*) The purely stereophonic records constituted by a record of one source of sound and in which the amplitudes of the various sound tracks differ in value and are phase-displaced in a variable manner.

(*b*) The admixed record constituted by a record of another source of sound and in which the amplitudes of the various sound tracks differ in value but have a constant relative phase-position.

In the above embodiment a stereophonic record is assumed in which the entire frequency range is recorded in each sound track. The invention may, however, be applied to records in which only the comparatively high frequencies are recorded stereophonically in several sound tracks whereas the low-frequency range is recorded non-stereophonically in a single sound track.

In mixing such stereophonic records with a record obtained in non-stereophonic fashion it is only necessary for the sound intensity of the high frequency range of the last-mentioned record to be controlled in each channel since the low frequencies practically do not exhibit any stereophonic effect.

What I claim is:

1. In mixing stereophonic sound and non-stereophonic sound from another source, the steps of picking up the stereophonic sound by a plurality of microphones and individually transmitting the sound currents by a plurality of individual channels, picking up the non-stereophonic sound by a single microphone and transmitting the sound currents by a single channel, and mixing the non-stereophonic sound currents into all of the stereophonic sound current channels with intensity levels which are independent of the intensity level of the stereophonic sound currents in each channel.

2. A sound record comprising several sound tracks, wherein these tracks constitute a stereophonic record of one source of sound and a non-stereophonic record of another source, the amplitudes in the tracks being different in both value and phase in the case of the first sound and in the second case being different in value but of constant relative phase.

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