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(54) IMPROVEMENTS IN AND RELATING TO SOUND ON SOUND RECORDINGS

(71) We, AGFA-GEVAERT AKTIENGESELLSCHAFT, a body corporate recognised under German Law, of Leverkusen, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to the recording of sound on a magnetic sound track in such a manner that one sound recording is superimposed on another.

When recording the sound track of a cinematograph film it is known to record first a recording of background sound, for example, music, and thereafter to superimpose a recording of an additional sound or sounds, for example, speech. When, for example, the additional sound recording is a speech recording, the possibility of a mistake or the necessity for a subsequent alteration to the speech recording cannot be excluded. In order to make a subsequent correction to the speech recording, however, it is generally necessary to re-record the whole of the background sound recording on the film.

The invention provides a method of recording sound on a magnetic sound track, which comprises pre-recording an intermittent sound or sounds on the track and thereafter superimposing on the pre-recording of the intermittent sound or sounds a further sound recording, the lever of the further recording being attenuated on those portions of the track that carry the pre-recorded sound signals.

The invention also provides apparatus for recording sound on a magnetic sound track, which comprises means for recording sound on the track, means for detecting pre-recorded signals on the track at a position in advance of the recording means and means arranged to attenuate, in response to the detected signals, the lever of the sound recording on those portions of the track that carry the pre-recorded sound signals.

Because the intermittent sound or sounds, for example, speech, are recorded first, any alterations that may have to be made can be effected before the further sound recording, for example, a recording of background music, is superimposed. At the same time, the attenuation of the additional recording on those portions of the track that carry the pre-recorded signals allows the pre-recording to be heard on reproduction of the recorded sound.

The method is especially advantageous when the magnetic sound track is a sound track of a cinematograph film.

A single main sound head may be both used to pre-record the intermittent sound recording and to record the additional sound recording on the magnetic track of the film.

Preferably, the detecting means comprises a sound head and the attenuating means comprises a field effect transistor connected in series with the main sound head, the gate of the field effect transistor being connected to a capacitance-resistance circuit actuable by a switching member to cause gradual attenuation of the sound recording.

The switching member is preferably a relay, the contacts of which actuate the capacitance-resistance circuit.

When there is no intermittent sound recording detected by the detecting means, the field effect transistor is so switched that the resistance between its source and drain section is low. As a consequence of this, a current, which is sufficient to facilitate recording of the background sound, can flow through the coil of the main sound head. However, if there is an intermittent sound recording detected by the detection means, the relay causes, for example by the opening of a contact, the gate of the field effect transistor to receive a

potential such that the resistance between the source and drain of the field effect transistor is sufficiently high that no current can flow through the coil of the main sound head. In this situation the background sound recording cannot be applied to the magnetic track of the sound track by the main sound head.

Preferably, in order to prevent any overlapping when the background sound recording is superimposed on the pre-recorded sound on the magnetic track, the discharging time of the capacitor, when the contact of the relay opens, is less than or equal to the time taken by any point on the sound track to travel the distance between a sound head of the detecting means and the main sound head. In addition, it is preferable that the length of sound track between the sound head and the main sound head is less than the shortest section of magnetic track carrying a pre-recorded sound recording. In practice, this is generally the case.

Advantageously, in order to ensure clear differentiation between the sound levels of the background sound recording and the pre-recorded intermittent sound recordings, especially at the end of each section of intermittent sound, the relay has a response time-lag which is greater than or equal to the time taken for any point on the film to pass from the sound head to the main sound head. In this way, any decrease in the attenuation of the background sound at the main sound head only begins when the end of each section of intermittent sound recording has reached the main sound head.

One form of sound recording apparatus constructed in accordance with the invention, will now be described, by way of example, with reference to the accompanying drawing, the single figure of which illustrates schematically the layout of the apparatus.

Referring to the accompanying drawing, the apparatus, through which a film can pass in the direction indicated by the arrow A includes a projection lamp 2 and an objective lens 3. Before passing the projection lamp, the film passes a sound head 4 having a coil 5, which is situated in the input circuit of an amplifier 6. Connected to the output circuit of the amplifier is a relay 7.

After passing the projection lamp 2, the film 1 passes a main sound head 8, the coil of which is indicated by the reference numeral 9. The coil 9 is connected in series with a field effect transistor 10, the sink and drain sections of which are indicated by the reference numerals 10*a* and 10*b*, respectively, and the gate section of which is indicated by the reference numeral 10*c*. The gate 10*c* is connected to a capacitor 11 which has a resistor 12 connected in parallel with it. Connected in series with the resistor 12 is a further resistor 13 which can be connected to the negative pole of a voltage source 16 by way of a contact 14 and a switch 15. The contact 14 is a contact of the relay 7, and the circuit including the resistors 12 and 13 and the capacitor 11 is referred to hereinafter as the RC-section.

The coil 9 of the main sound head 8 is also connected to an amplifier 17 having input terminals E. The coil 9 of the main sound head 8 is also connected in series with a high frequency generator 18.

For use with the apparatus there is provided a microphone 19 and a record-player 20.

The method of operation of the apparatus is as follows:

First, the microphone 19 is connected to the input E of the amplifier 17. The switch 15 is then closed and, using the microphone 19, an intermittent recording, for example, speech, is applied to the magnetic track of the film 1 at the required places. The speech recording is then recorded on the magnetic track of the film 1 by way of the main sound head 8, since, with the contact 14 closed, there is a negative potential at the gate 10*c* of the field effect transistor 10, so that the feld effect transistor 10 is switched to allow an alternating current characterising the speech recording to flow through the coil 9 of the main sound head.

The whole film 1 is then re-wound after completion of the intermittent recording on the magnetic track of the film 1; thereby enabling a further recording, for example, a musical recording to be superimposed on the recording of the intermittent sound in the following way.

The microphone 19 is replaced by the record-player 20 and the film 1 is again fed through the apparatus. When the speech recording 1*a* reaches the auxiliary sound head 4, it produces in the coil 5 a voltage which is amplified by means of the amplifier 6. As a result, the relay 7 is switched to cause the contact 14 to open with the result that the capacitor 11 discharges. The period of time during which the capacitor 11 discharges depends on the capacitance of the capacitor and the resistance of the resistor 12. During this period the voltage at the gate of the field effect transistor 10 slowly decreases and consequently the resistance between the source and drain sections of the field effect transistor 10 gradually increases. As the resistance between the source and drain increases so the magnetic flux through the coil 9 gradually decreases, thereby attenuating the intensity of the musical recording.

Depending on the choice of parameters in the components of the circuit attenuation of the intensity of the musical recording can be

so adjusted to reduce the intensity of the music recorded on the film by any degree. This includes the situation where the music cannot be heard at all when the film 1 is played back.

The sections of the film 1 that carry an intermittent recording are labelled 1*a*, and when a section 1*a* has passed the sound head 4, the armature of the relay 7 disconnects after a certain delay. The armature disconnects owing to a lack of input voltage, the result being that the contact 14 is closed again after the delay. The 'drop-out' delay time of the relay 7 is sufficiently large to allow the armature of the relay to remain in a connected position until the end of the speech recording section 1*a* has reached the sound head 8. When the contact 14 is closed the capacitor 11 slowly recharges and the time taken for the capacitor to recharge depends on the resistance value of the resister 13 and the capacitance of the capacitor 11. During this recharging time, the voltage at the gate of the field effect transistor slowly builds up, and the resistance between the source and drain decreases. As a result, the attenuation of the flux through the coil 9 of the main sound head 8 slowly decreases. In this way, when the end of a section of an intermittent record has passed the main sound head 8, then the further recording, for example, the musical recording from the record-player 20, is recorded on the sound track of the film 1 without any attenuation. This recording is made by way of the coil 9 of the main sound head.

By using a relay with a drop-out delay time, that situation in which the further recording, for example, the musical recording, reattains its full intensity before or when the end of a section 1*a* carrying the speech recording has reached the main sound head 8 is avoided. It is only when the end of a section 1*a* carrying an intermittent recording has reached the main sound head 8 that the contact 14 of the relay 7 is closed, so that only then can the charging of the capacitor 11 take place. Overlapping of the speech and musical recordings is thus avoided. This overlap is avoided at the beginning of a speech recording by arranging for the discharge time of the capacitor 11 to be less than or equal to the time taken by a point P on the film to travel the distance between the sound head 4 and the main sound head 8. This arrangement ensures that when the beginning P of a section 1*a* carrying an intermittent recording reaches the main sound head 8, the intensity of the further recording is already at its lowest value.

As an alternative to using the drop-out delay of the relay 7, the distance between the main sound head 8 and the sound head 4 can be so arranged that the length of the piece of film between the auxiliary sound head 4 and the main sound head 8 is less than the shortest magnetic track section 1*a* provided with a speech recording. The time constant of the section 11, 13 hereinafter referred to as the time-section should then be selected so that the attenuation of the magnetic flux through the coil 9 of the sound head 8 is still sufficient to avoid undue decrease in attenuation of the further recording at the end of each intermittent recording section 1*a* and so to prevent appreciable build-up of the sound recording before the end of the recording section 1*a* has passed the sound head 8.

Instead of using a relay to actuate the capacitance-resistance circuit, a transistor or field effect transistor connected in series with the circuit may be used.

WHAT WE CLAIM IS:—

1. A method of recording sound on a magnetic sound track, which comprises pre-recording an intermittent sound or sounds on the track and thereafter superimposing on the pre-recording of the intermittent sound or sounds a further sound recording, the level of the further recording being attenuated on those portions of the track that carry the pre-recorded sound signals.

2. A method as claimed in claim 1, wherein the magnetic sound track is a sound track of a cinematograph film.

3. A method as claimed in claim 1 or claim 2, wherein during the superimposition of the further sound recording, the presence of the pre-recorded sound signals on the track is detected in advance and the level of the further recording is attenuated in response to the detected signals.

4. Apparatus for recording sound on a magnetic sound track, which comprises means for recording sound on the track, means for detecting pre-recorded signals on the track at a position in advance of the recording means and means arranged to attenuate, in response to the detected signals, the level of the sound recording on those portions of the track that carry the pre-recorded sound signals.

5. Apparatus as claimed in claim 4, which is suitable for recording sound on the magnetic sound track of a cinematograph film.

6. Apparatus as claimed in claim 4 or claim 5, wherein the recording means comprises a main sound head, the detecting means comprises a sound head and the attenuating means comprises a field effect transistor connected in series with the main sound head, the gate of the field effect transistor being connected to a capacitance-resistance circuit actuable by a switching member to cause gradual attenuation of the sound recording.

so adjusted to reduce the intensity of the music recorded on the film by any degree. This includes the situation where the music cannot be heard at all when the film 1 is played back.

The sections of the film 1 that carry an intermittent recording are labelled 1*a*, and when a section 1*a* has passed the sound head 4, the armature of the relay 7 disconnects after a certain delay. The armature disconnects owing to a lack of input voltage, the result being that the contact 14 is closed again after the delay. The 'drop-out' delay time of the relay 7 is sufficiently large to allow the armature of the relay to remain in a connected position until the end of the speech recording section 1*a* has reached the sound head 8. When the contact 14 is closed the capacitor 11 slowly recharges and the time taken for the capacitor to recharge depends on the resistance value of the resister 13 and the capacitance of the capacitor 11. During this recharging time, the voltage at the gate of the field effect transistor slowly builds up, and the resistance between the source and drain decreases. As a result, the attenuation of the flux through the coil 9 of the main sound head 8 slowly decreases. In this way, when the end of a section of an intermittent record has passed the main sound head 8, then the further recording, for example, the musical recording from the record-player 20, is recorded on the sound track of the film 1 without any attenuation. This recording is made by way of the coil 9 of the main sound head.

By using a relay with a drop-out delay time, that situation in which the further recording, for example, the musical recording, reattains its full intensity before or when the end of a section 1*a* carrying the speech recording has reached the main sound head 8 is avoided. It is only when the end of a section 1*a* carrying an intermittent recording has reached the main sound head 8 that the contact 14 of the relay 7 is closed, so that only then can the charging of the capacitor 11 take place. Overlapping of the speech and musical recordings is thus avoided. This overlap is avoided at the beginning of a speech recording by arranging for the discharge time of the capacitor 11 to be less than or equal to the time taken by a point P on the film to travel the distance between the sound head 4 and the main sound head 8. This arrangement ensures that when the beginning P of a section 1*a* carrying an intermittent recording reaches the main sound head 8, the intensity of the further recording is already at its lowest value.

As an alternative to using the drop-out delay of the relay 7, the distance between the main sound head 8 and the sound head 4 can be so arranged that the length of the piece of film between the auxiliary sound head 4 and the main sound head 8 is less than the shortest magnetic track section 1*a* provided with a speech recording. The time constant of the section 11, 13 hereinafter referred to as the time-section should then be selected so that the attenuation of the magnetic flux through the coil 9 of the sound head 8 is still sufficient to avoid undue decrease in attenuation of the further recording at the end of each intermittent recording section 1*a* and so to prevent appreciable build-up of the sound recording before the end of the recording section 1*a* has passed the sound head 8.

Instead of using a relay to actuate the capacitance-resistance circuit, a transistor or field effect transistor connected in series with the circuit may be used.

WHAT WE CLAIM IS:—

1. A method of recording sound on a magnetic sound track, which comprises pre-recording an intermittent sound or sounds on the track and thereafter superimposing on the pre-recording of the intermittent sound or sounds a further sound recording, the level of the further recording being attenuated on those portions of the track that carry the pre-recorded sound signals.

2. A method as claimed in claim 1, wherein the magnetic sound track is a sound track of a cinematograph film.

3. A method as claimed in claim 1 or claim 2, wherein during the superimposition of the further sound recording, the presence of the pre-recorded sound signals on the track is detected in advance and the level of the further recording is attenuated in response to the detected signals.

4. Apparatus for recording sound on a magnetic sound track, which comprises means for recording sound on the track, means for detecting pre-recorded signals on the track at a position in advance of the recording means and means arranged to attenuate, in response to the detected signals, the level of the sound recording on those portions of the track that carry the pre-recorded sound signals.

5. Apparatus as claimed in claim 4, which is suitable for recording sound on the magnetic sound track of a cinematograph film.

6. Apparatus as claimed in claim 4 or claim 5, wherein the recording means comprises a main sound head, the detecting means comprises a sound head and the attenuating means comprises a field effect transistor connected in series with the main sound head, the gate of the field effect transistor being connected to a capacitance-resistance circuit actuable by a switching member to cause gradual attenuation of the sound recording.

* C L M S *

7. Apparatus as claimed in claim 6, in which the switching member comprises a relay the contacts of which actuate the capacitance-resistance circuit.

8. Apparatus as claimed in claim 6 or claim 7, which is so arranged that a voltage is applied to the gate of the field effect transistor when no sound recording is detected by the detecting means.

9. Apparatus as claimed in any one of claims 6 to 8, in which the discharging time of the capacitor in the capacitance-resistance circuit is so arranged to be less than or equal to the time taken by a point on the film to travel the distance between the sound head and the main sound head as the film is fed through the apparatus.

10. Apparatus as claimed in any one of claims 4 to 8, which is so arranged that the length of magnetic sound track between the detecting means and the recording means is less than the shortest section of sound recording on the magnetic sound track.

11. Apparatus as claimed in any one of claims 7 to 10, in which the relay has a response time-lag which is so arranged to be greater than or equal to the time taken by a point on the sound track to travel from the sound head to the main sound head as the sound track is fed through the apparatus.

12. Apparatus as claimed in claim 6, in which the switching member comprises a transistor which is connected in series with the capacitance-resistance circuit.

13. Apparatus as claimed in claim 6 in which the switching member comprises a field effect transistor which is connected in series with the capacitance-resistance circuit.

14. A method of recording sound, substantially as hereinbefore described with reference to the accompanying drawing.

15. Apparatus for recording sound, substantially as hereinbefore described with reference to, and as shown in, the accompanying drawing.

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