

May 16, 1933.

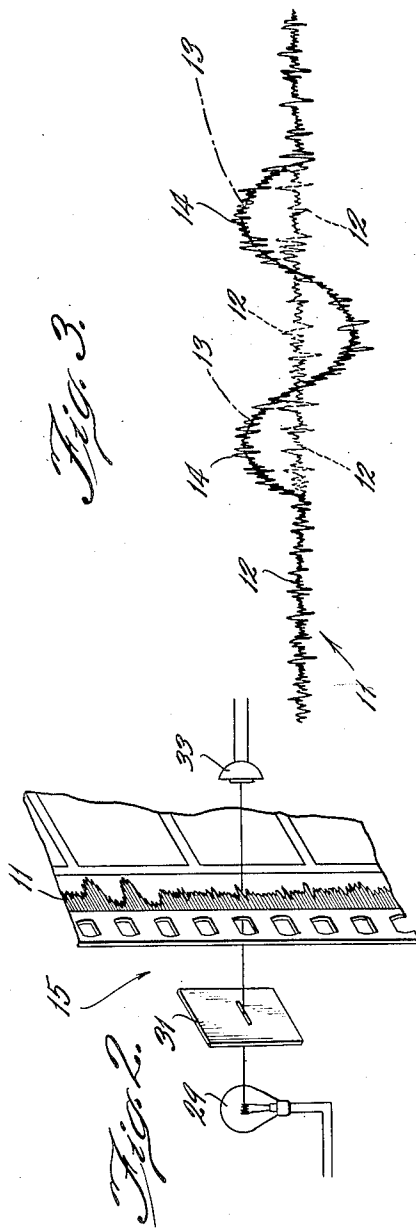
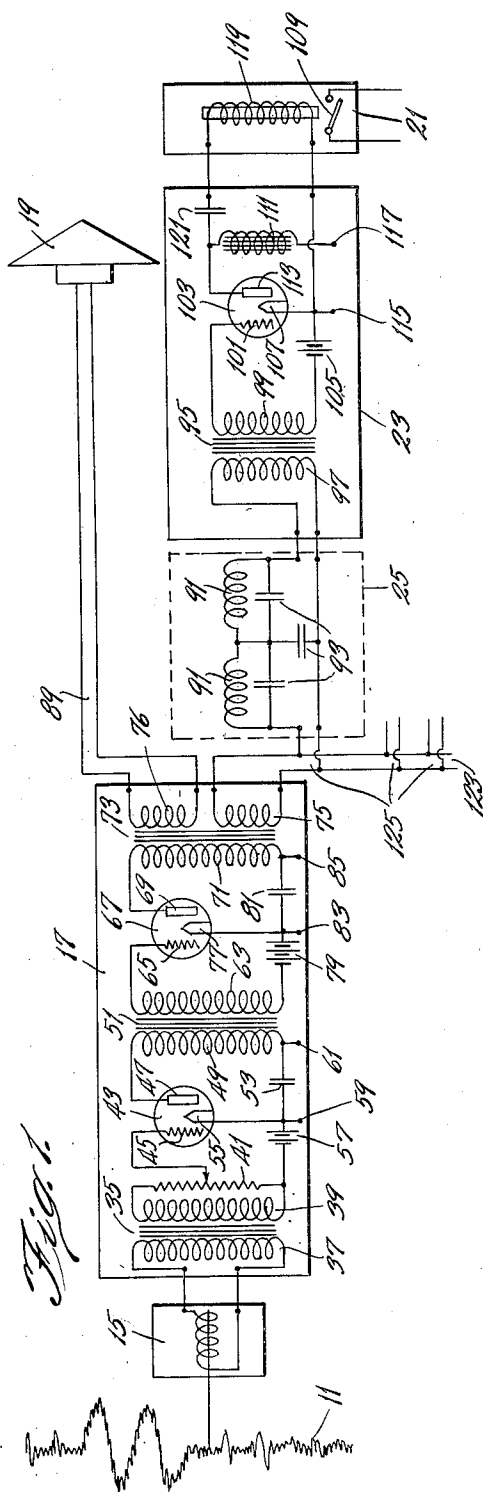
J. E. JENKINS ET AL

1,909,765

SOUND CONTROL METHOD AND MEANS FOR PRACTICING SAME

Filed Nov. 9, 1932

3 Sheets-Sheet 1



Inventors:
John Elliott Jenkins &
Samuel E. Adair
By: Cox & Moore

Attys.

May 16, 1933.

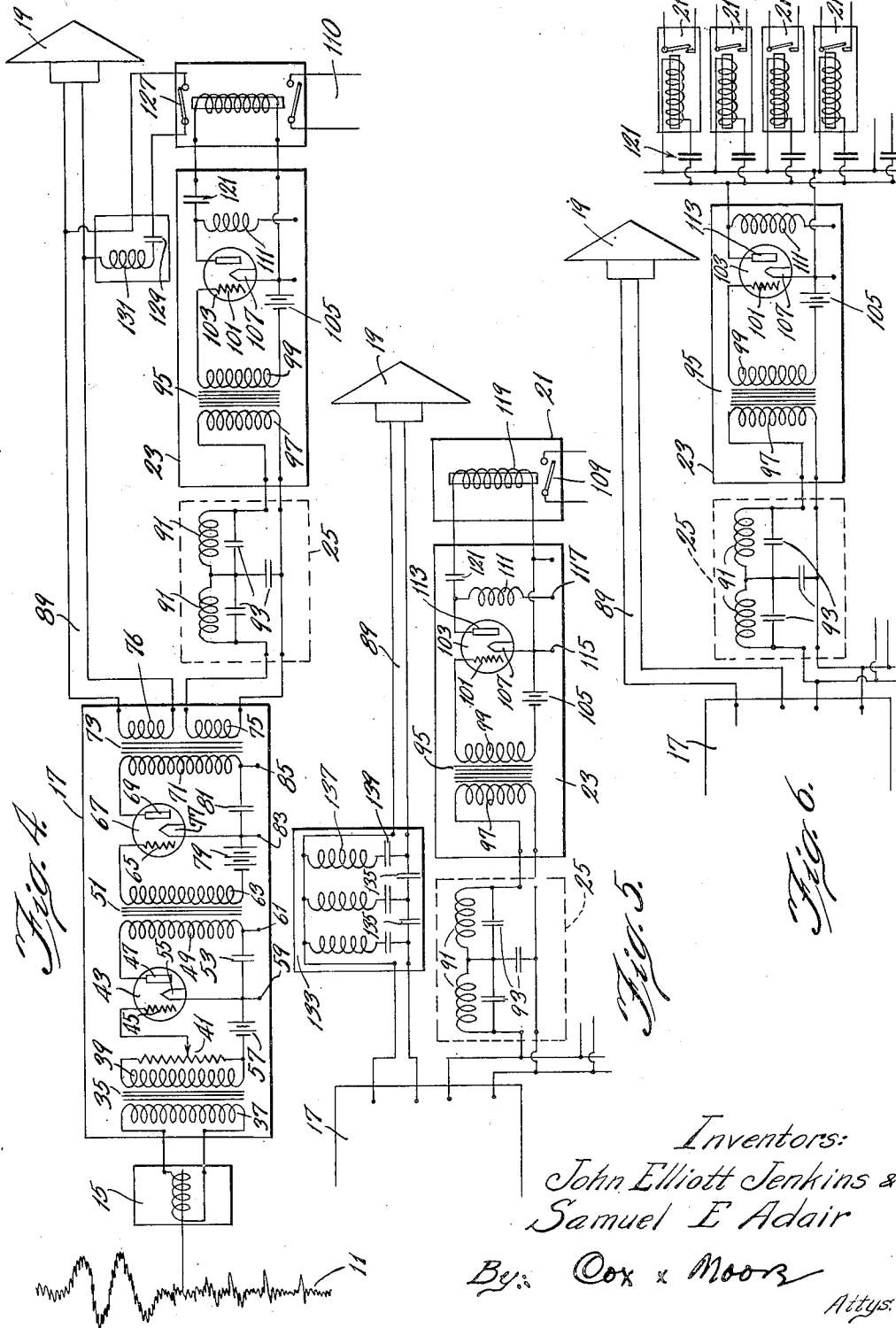
J. E. JENKINS ET AL

1,909,765

SOUND CONTROL METHOD AND MEANS FOR PRACTICING SAME

Filed Nov. 9, 1932

3 Sheets-Sheet 2



Inventors:
John Elliott Jenkins &
Samuel E Adair

By: Cox & Moore
Attys.

May 16, 1933.

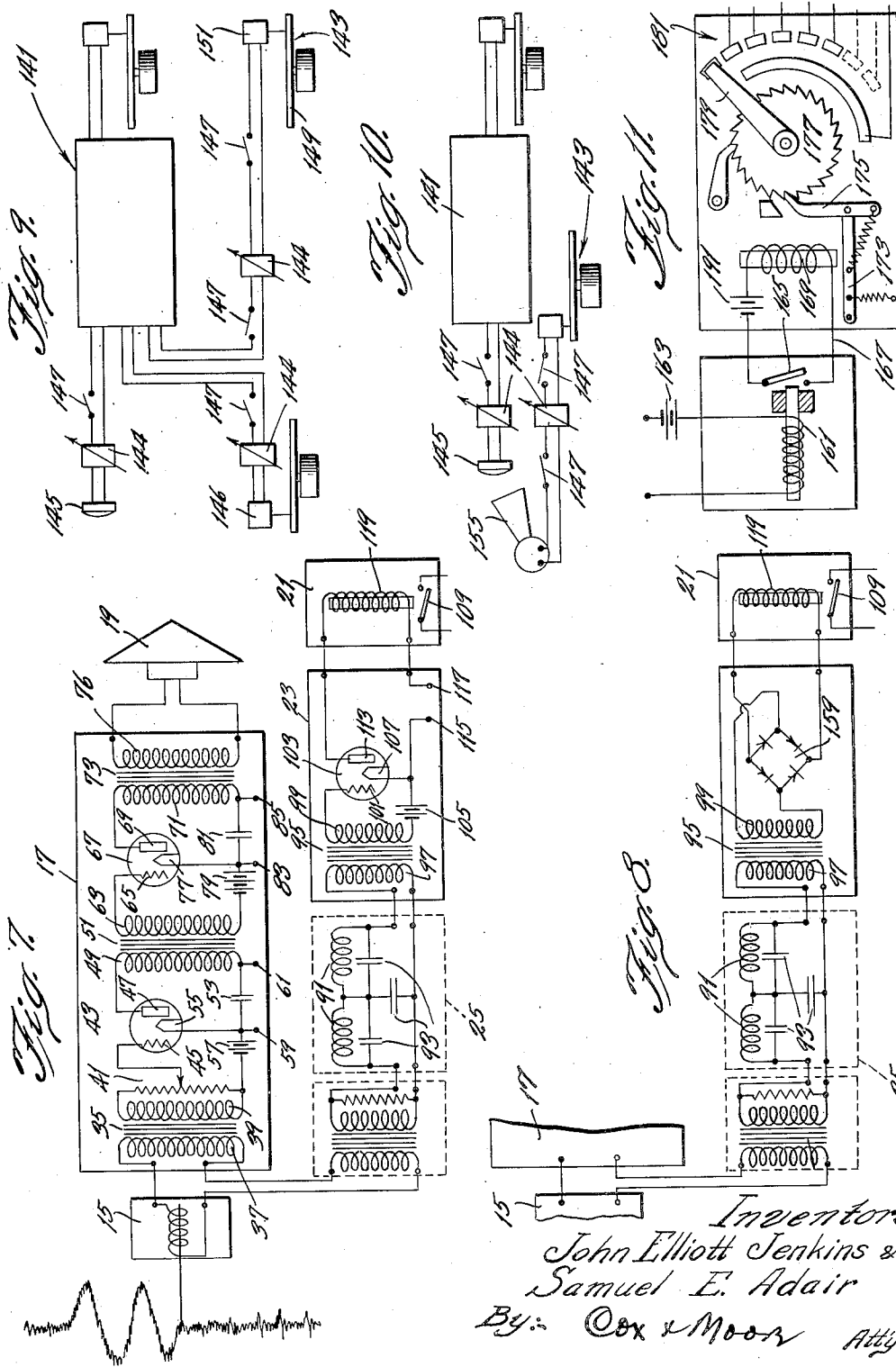
J. E. JENKINS ET AL

1,909,765

SOUND CONTROL METHOD AND MEANS FOR PRACTICING SAME

Filed Nov. 9, 1932

3 Sheets-Sheet 3



Inventors:
John Elliott Jenkins &
Samuel E. Adair
By: Cox & Moor Attys

UNITED STATES PATENT OFFICE

JOHN ELLIOTT JENKINS AND SAMUEL E. ADAIR, OF CHICAGO, ILLINOIS, ASSIGNORS TO
JENKINS & ADAIR, INC., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

SOUND CONTROL METHOD AND MEANS FOR PRACTICING SAME

Application filed November 9, 1932. Serial No. 641,842.

Our invention relates in general to means for and method of controlling operative devices in conjunction with artificially reproduced sounds.

5 An object of the invention is to control the operation of any device to be operated in conjunction with the reproduction of a predetermined sound sequence or other sensory effect from a suitable record or
10 sound source, the operation of the device being controlled from such record or sound source.

Another object resides in providing means including a sound record for reproducing a
15 sound sequence and for actuating an operable device from the sound record itself during the reproduction of the sequence and without interrupting the same.

Another object is to superimpose operating frequency vibrations at intervals in a sound or similar record whereby to operate a
20 tuned relay, or other device sensitive to the operating frequency, at one or more intervals as the sound record is reproduced, in order to operate, through the agency of the relay,
25 any mechanical or electrical device in timed relationship with the sound sequence or other sensory effects as reproduced from the record of the sound.

Another object is to produce a record or sound track from which sound or other sensory effects may be reproduced and from
30 which track or record operating devices may be controlled to operate in timed relation with the reproduced sensory effects.

Another object resides in the method of reproducing sound or other sensory effects from a record or other sound source while
40 controlling the operation of operable devices in timed relation and in conjunction with the sensory effects as the same are reproduced.

Another object resides in providing automatic lecturing and demonstrating equipment whereby a lecture may be reproduced
45 from a sound track or record, which also controls the operation of the device being operated or demonstrated in conjunction with the lecture, such equipment being especially well adapted for operating mechanical displays, such as may be arranged in shop win-

dows, or any other convenient display location in conjunction with a loud speaker which broadcasts a sound sequence which may comprise an oral description of the device or devices being operated, or music, or
55 both speech and instrumental music as a pleasing background.

Another object is to provide means for and a method of automatically displaying, in sequence, a series of pictures or other visual effects in conjunction with a lecture or
60 other sound sequence reproduced from a record or track, the control of the display being accomplished by said record or track.

Another object is to provide an automatically operating apparatus for controlling the volume or pitch of sounds or noises produced in timed-relationship with displayed picture sequences or other visual effects as in the operation of the so-called talking moving picture, the apparatus also being adaptable for
70 the control of any operable device operated in conjunction with the displayed picture sequence or to operate warning signals for any purpose during the progress of the picture sequence, such, for example, as to operate
75 warning lights in the manager's office, or in the box office, or at other stations in the theatre in order to advise the staff of the theatre of the progress of the picture sequence being shown.

Another object of our invention resides in providing a talking moving picture apparatus for reproducing a sound sequence from
85 a record or track, including means for controlling the reproduced sounds and for actuating separate operating devices for controlling the theatre lights or signalling to various stations in the theatre as the sound sequence progresses, said means being actuated from the sound record or track itself.

Another object of our invention resides in providing an apparatus for reproducing a sound sequence from a record or track including means for controlling the volume or pitch of the reproduced sound and means for actuating a separate device operable in conjunction with the reproduction of the sound effect, said device being actuated from
100

the sound track without being affected by the volume or pitch control.

Another object is to provide apparatus for producing a record or sound track from which a sound sequence, or other sequence of sensory effects, may be reproduced and from which record or track, operable devices may be actuated or controlled in timed relationship with the effects reproduced from the track or record.

Other objects of our invention reside in the adaptations of the broad principles of our invention to the various types of specific devices hereinafter disclosed.

Numerous other objects and advantages of the invention will be appreciated as the same is more fully understood from the following description, which, taken with the accompanying drawings, discloses preferred embodiments of and for the purpose of disclosing our invention.

Referring to the drawings:

Figure 1 is a diagrammatic representation of a system embodying our invention, said system being actuated from a grooved sound track or record by means of a magnetic pick-up device;

Figure 2 is a diagrammatic representation of a photo-electric pick-up device, which may be substituted for the magnetic pick-up in the system shown in Figure 1 for use with a photographic record;

Figure 3 is an enlarged diagrammatic representation of one form of sound record or track having an operating frequency superimposed thereon in accordance with our present invention;

Figures 4, 5, 6, 7, and 8 are diagrammatic representations of modified systems embodying our invention;

Figures 9 and 10 are diagrammatic representations of apparatus for making a record for use in practicing our invention; and

Figure 11 is a diagrammatic sketch showing an operating device in the form of an operating circuit adapted for actuation in accordance with our present invention.

While we will hereinafter describe the operation of our sound reproducing and device actuating apparatus as accomplished from a previously made record having a device actuating component therein, we do not wish to limit the invention to the use of a recording as the actuating source of the apparatus but contemplate the actuation of the apparatus directly from original sound applied to the apparatus through a microphone or other sound sensitive device, the device actuating portion of the apparatus being operated by a preselected component of the original sound applied to the microphone.

To illustrate the invention, we have shown on the drawings, in Figures 1, 4, 5, and 6, electrical systems for reproducing sound and, at the same time, controlling operable de-

vices shown as tuned relays 21 from a record represented generally at 11, through a pick-up device 15, although it should be remembered that the apparatus can be operated directly from original sound sources by substituting a microphone or other sound sensitive device for the pickup device 15. The sound record 11 may be made in any suitable or convenient manner known to the art and may be of any suitable form, that is to say, may be a groove formed in a cylinder or disk, may be a photographic record on film, or a magnetic record on wire.

As shown in Figure 3, the record 11 consists of a single recorded track incorporating both a normal sound recording 12, which, for simplicity, we shall call the sound track, and a device-operating recording 13, which we shall call the operating component; that is to say, the normal sound track is combined with the operating component so that the record 11 consists, in part, of recorded vibrations 14, comprising the resultant of the sound track 12, and the operating component 13.

The operating component 13, whether the apparatus is actuated from original sound sources or from fabricated record or from a circuit carrying audio frequency and device-operating vibrations, may have a sinusoidal wave form as shown in Figure 3, or may be of more complicated configuration. The wave may be a simple wave or may be the envelope of an oscillation of higher frequency. The wave may have uniform frequency or may be a coded series of vibrations, in which case, the relay 21 is a coded relay adjusted to react only to the particular coded component in response to which it is desired to have the relay react.

The operating component moreover need not necessarily be artificially applied to the record, or the original sound, but may be a preselected component of the sound sequence itself, the relay 21 being adjusted to react to the particular selected component, as for instance, in orchestral music, the relay may be set to operate in response to a particular note of a particular instrument.

The record 11, if the operating component is applied thereto artificially, may be prepared in any suitable or convenient manner as by connecting, with a suitable recording apparatus 141, a suitable device 143 for delivering to the recording apparatus the operating component at the proper time so that the same may be superposed upon the sound vibrations as they are recorded, the sound vibrations being fed into the sound recording device by any suitable pickup, such as a microphone 145, if the record is made from the original sound, or a pickup device 146, where the record 11 is made from a previously recorded sound track, or a microphone and pickup may be used together if desired as

where previously recorded incidental music is to be "dubbed" as a background, in the record, for the original sound.

The oscillating device 143 may be an oscillating electric circuit tuned to the frequency desired for the operating component, or may be a previously prepared record of an operating vibration having a desired frequency or frequencies. The oscillating device is connected with the recording device through a normally open control key 147, which key is closed by the operator whenever it is desired to impress the operating component upon the sound recording. This is known as "dubbing" the operating component on the sound track.

Alternatively, as shown in Figure 10, a device 155, capable of creating vibrations in the air, may be positioned near the sound pickup 157 of the recording device 141, the vibration device being actuated at intervals to add the desired operating component to the sound waves reaching the pickup device 157.

Numerous other methods of superposing the operating frequency upon the sound track in the record will suggest themselves to those familiar with the art of recording sound waves and our invention is not necessarily limited to any particular mode of producing the composite record 11. It is, however, preferable to prepare the composite record 11 by "dubbing" the operating frequency upon the sound track, rather than by adding the same to the sound waves before they are applied to the pickup 157.

The foregoing methods may be employed in making record grooves in wax or similar material, and in making magnetized wire records and photographic records. We also contemplate making magnetized wire and photographic records by first applying the normal sound track or recording and then applying the actuating component upon the recorded sound track. In the case of the magnetic record, this may be accomplished by magnetizing the wire at the proper places in accordance with the desired operating component, the wire being either previously or subsequently treated to magnetize it in accordance with the sound track recording.

In photographic records, the operating component may be photographed on the undeveloped negative on which the sound track record is subsequently or has previously been photographed, and the double exposure developed on the negative from which a positive print of the composite recording can be made, or a negative of a normal sound track record may be printed as a positive and the print of a separate negative of the operating component superimposed on the positive print of the sound sequence and the double exposure developed on the positive.

The sound reproducing and device-actuating system consists of a suitable pickup de-

vice 15 adapted to be vibrated in accordance with the vibrations recorded on the record 11, a sound emitting device or loud speaker 19 connected to the pickup preferably through the amplifying system 17, and a tuned relay 21 adapted to be actuated by the operating component of the record and also connected with the pickup device preferably through the amplifying system and through a relay operating system 23 and filter 25.

The pickup device 15, as shown in Figures 1 and 5 of the drawings, may consist of an ordinary magnetic device, such as is commonly used in conjunction with the ordinary grooved phonograph record, or, an ordinary mechanical phonograph pickup may be used in conjunction with a microphone to impress the vibrations of the record 11 upon the input of the amplifying system 17.

Instead of using a pickup 15, we may apply the vibrations to the input of the system by means of any circuit carrying audible frequencies, such for example as a radio set, or a wired communication system.

In Figure 2 of the drawings, the sound track 11 is shown as a photographic record, such as is commonly used in the audible moving picture art and the pickup device includes the light source 29, the aperture 31 and a target 33, comprising a photo-electric cell, or other light sensitive device, connected to the input of the system and upon which light rays from the light source impinge after passing through the aperture and the photographic record, as is well known in the art.

Our invention does not necessarily reside in the particular form of record and cooperating pickup device employed but any suitable or convenient form or forms of record and cooperating pickup device may be used to apply the vibrations of the record upon the sound reproducing and device-actuating system, or the vibrations may be applied directly through a microphone or through suitable circuits carrying vibratory electro-magnetic impulses.

Similarly, the amplifying system 17 may be of any suitable or convenient form or arrangement for the purpose of receiving the vibrations initiated therein by the pickup device of whatever character used, amplifying the vibrations and delivering the amplified vibrations to the sound emitting speaker 19 and to the relay 21. In some cases, it may be possible to omit the amplifying system entirely, but ordinarily some form of amplification is desirable.

To illustrate the invention, therefore, we have shown an amplifying system comprising a transformer 35, the primary winding 37 of which is provided for connection with the pickup and thus forms the input of the system and the secondary winding 39 of which is connected through a variable resistance volume control arranged as a potenti-

ometer 41 to a vacuum tube 43, the grid 45 of which is connected with the shiftable member of the potentiometer 41, the plate 47 of the vacuum tube 43 being connected to one end of the primary winding 49 of a transformer 51, the other end of the primary winding being connected through a condenser 53, to one side of the filament 55 of the vacuum tube, said side of the filament being also connected through the grid bias means, preferably an electric battery 57, with the potentiometer 41. The filament 55 may be heated in any convenient manner as is well known in the art and terminals 59 and 61 are provided for supplying the plate potential. One end of the secondary winding 63 of the transformer 51 is connected with the grid 65 of a vacuum tube 67, the plate 69 of which is connected to one end of the primary winding 71 of a transformer 73, the secondary windings 75 and 76 of which comprise the outputs of the amplifying system 17. The filament 77 of the vacuum valve 67 may be heated in any suitable or convenient manner and one side of the filament is connected through the grid bias means, preferably an electric battery 79, with the secondary winding 63 of the transformer 51, the same side of the filament 77 being connected through the condenser 81 with the primary winding 71 of the transformer 73. Terminals 83 and 85 are provided for supplying the plate potential.

The speaker 19 is connected by means of suitable conductors 89 to the winding 76, the relay 21 being connected, through the relay operating system 23 and the filter 25, to the winding 75.

The filter 25 comprises inductance coils 91 and condensers 93 and forms a filter tuned to the frequency of the operating component of the record 11, so as to pass the operating component freely while attenuating and suppressing other frequencies.

The input of the filter is connected with the output winding 75 of the amplifying system 17 and the output of the filter is connected to the input of the relay operating system 23 which comprises means to amplify the operating component and includes a transformer 95, the primary 97 of which forms the input of the system and the secondary 99 of which is connected at one end to the grid 101 of a vacuum tube 103 and the other end of which is connected through a grid biasing means, preferably an electrical battery 105, with one side of the filament 107. The filament 107 may be heated by any suitable or convenient means well known in the art and terminals 115 and 117 are provided for applying the plate potential between the plate and filament, there being a choke coil 111 in series with the plate and filament across the plate potential.

The output of the amplifier 23 is between

the filament and the plate through the condenser 121 and the coil 119 of the tuned relay is connected across the output of the amplifier 23. The relay 21, illustrated in Figures 1, 5, 6, and 7 is adapted for operation by alternating currents delivered to the coil, the function of the relay operating system 23 being to amplify the power of the relay operating component sufficiently to operate the relay, which may require for its operation more power than is delivered at the output of the amplifying system 17. The relay, when actuated by the operating component, operates the shiftable member 109, which may be mechanically connected to control a device to be operated, or, as illustrated, may be arranged to operate an electrical switch for controlling the circuit 110, which, in turn, may be connected to effect the electrical control of any device to be operated.

While in some cases, it may not be necessary to utilize the amplifier 23 and the filter 25 since it is possible to operate the relay 21 directly from the output of the amplifier system 17, it is, however, desirable to provide these refinements in order to ensure positive operation of the relay in response to the operating component on the record.

Any desired number of relays 21 may be connected in parallel and actuated from the output of the amplifier 17, as indicated in Figure 1, by connecting the output to the bus connectors 123 and connecting, as at 125, a plurality of relays similar to the relay 21 for operation from the bus connectors 123, the relays being individually tuned and connected directly to the bus connectors, or relays, either tuned or untuned, may be connected through the intermediary of band pass filters, that is to say filters adapted to pass the particular frequency to which the relays are desired to respond.

If each relay is connected to the bus connectors through the intermediary of a filter, each filter may be selected or adjusted to pass a particular frequency so that by forming operating components 13 at different frequencies in the record, the several relays so connected may be caused to operate selectively.

Moreover, if the relay is connected with the output of the amplifying system 17 through a filter and an amplifier 23, the relay itself need not be accurately tuned to the frequency of the operating component as is the case if the filter is omitted.

It is also possible to operate a plurality of tuned relays 21 from the output of the relay operating system 23. With such an arrangement, the relays may be mechanically tuned accurately each to respond to an operating component for a particular predetermined frequency in order to obtain selective operation of the relays, the filter, which is

preferably used in the combination, being a low pass filter to pass all frequencies within the tuned range of the relays. This arrangement is illustrated in Figure 6 of the drawings.

If the operating component has a frequency within the range of audible frequencies, the speaker or sound-emitting device 19 will, of course, respond to the audible frequency of the operating component whenever the same is impressed upon the system by the pick-up device.

It is possible to utilize a speaker 19 which will react only to a certain band of frequencies within the audible range and for all ordinary purposes it is quite practical to use a speaker operating in the audible range of frequencies above 80 cycles and below 5,000 cycles since a speaker in this range will accurately reproduce all normal speech and music and we contemplate using such a band frequency speaker and to maintain the operating components at frequencies below 80 cycles and above 5,000 cycles, even though frequencies as low as 40 cycles and as high as 10,000 cycles are audible.

In some instances, however, it may be necessary to utilize operating components having frequencies within the range of the speaker and since the reproduction of the operating component as sound may be undesirable where the sound sequence is being reproduced for its pleasing effect, upon the hearer, we have, therefore, provided for eliminating the transmission of any sound by the device 19, which may be caused by the operating component.

As shown in Figure 4 of the drawings, the relay 21 is provided with contacts 127, which are connected to close a filter pass between the conductors 89 to eliminate the unwanted frequency, the contacts being arranged in series with a condenser 129 and an inductance coil 131 forming the filter.

As soon as the operating component becomes effective to actuate the relay 21, the contacts 127, which are normally open, will close and complete the filter circuit and the speaker consequently is silenced to the relay operating frequencies only.

We prefer, however, to filter the operating component from the circuit 89, leading to the speaker, by inserting in the conductors 89, between the output of the amplifying system 17 and the sound emitting device 19, a band eliminating filter 133 as shown in Figure 6, which functions to highly attenuate the frequencies of the operating components of the record.

As illustrated in Figure 5, the band eliminating filter may comprise condensers 135 in series in one of the conductors 89 and series connected inductance coils 137 and condensers 139 connected in parallel between the spaced conductors 89, there being a con-

denser 135 between each coil and condenser set 137—139 or any other suitable filter circuit may be utilized.

In Figure 7 of the drawings, we have shown the relay 21 connected through the relay operating circuit 23 and the filter 25 through the pick-up device 15. With this arrangement the relay operating component is delivered to the relay without passing through the amplifying system 17, which has the advantage that the relay is not subjected to the action of the volume control 41 of the amplifying system.

The filter 25 and relay actuating system 23, shown in Figure 8 of the drawings, may be of any suitable form and arrangement, and may be similar to those shown in Figures 1, 4, 5 and 6. However, we have shown an alternative arrangement for the relay operating system 23.

In Figures 1, 4, 5, and 6, the relays 21 are alternating current relays and are operated by the alternating currents set up by the actuating component in the relay operating system 23.

In Figures 7 and 8, however, we have shown a band pass filter, that is to say, a filter which is tuned to pass only the frequency at which the relay 21 is desired to operate and the relay operating system 23 in Figures 8 and 9 is adapted to rectify the alternating current delivered to it by the band pass filter and to pass the rectified direct current to the relays 21, which operate as direct current relays. It should be understood that this arrangement may also be utilized in the systems shown in Figures 1, 4, 5 and 6, and is preferred because of the more simplified electrical apparatus and connections.

The frequency is delivered to the relay operating system 23, which comprises the transformer 95, the vacuum tube 103 having a grid connected to one end of the secondary of the transformer 95 and a filament 107 connected through a grid bias 105 to the other end of the transformer secondary, the filament 107 being heated by any suitable or convenient means well known in the art and the coil 119 of the relay 21 being connected directly in series with a source of plate potential between the filament and the plate.

By providing a sufficiently high grid biasing potential by means of the battery 105, the tube is normally locked down to prevent any flow of current in the plate circuit, which includes the coil of the direct current relay 21. Whenever an operating frequency is delivered through the band pass filter, sufficient potential will be applied to the grid to overcome the grid biasing means and permit current to flow in the plate circuit. This will be a uni-directional current and will actuate the direct current relay. In such a system, the tube operates as a converter to

receive the alternates of the operating component and deliver them to the relay as direct operating current.

In Figure 8 of the drawings, we have illustrated another form of relay operating device 25, in which the current generated in the secondary of the transformer 95 is delivered to a rectifier of any suitable form, such as the copper-oxide rectifier 159, and the coil 119 of the direct current relay 21 is operated by direct current from the rectifier 159 whenever the band pass filter 25 passes the operating component to the primary of the transformer 95.

The shiftable element 109 of the relay 21 may be connected directly to a device to be operated, or may form a shiftable control contact for an electrical circuit 110, which may be arranged in any suitable manner as an electrical control for any device or device-operating circuit or system operated through the intermediary of the relay 21.

In Figure 11 of the drawings, we have shown an electric control system for operation by the circuit 110, the illustrated system comprising a slow acting relay 161, the operating coil of which is connected in the circuit 110 in series with a source of relay operating power 163. The armature 165 of the slow operating relay may be connected directly to a device to be operated or controlled, or may be connected to switch a circuit 167, which includes the operating coil of a relay 169 and a source of relay operating potential 171. The armature 173 of the relay 169 is or may be connected to actuate a pawl 175 operatively associated with a ratchet wheel 177, in turn connected to a member 179.

The relay 21, which is actuated in response to the operating component initiated in the pickup device, is preferably of the instantaneously acting type, which responds immediately to the operating component, and the slow acting relay is to protect the device ultimately controlled from accidental operation, as where a vibrating component equivalent to the operating component is accidentally initiated in the pickup, as for instance, where the record 11 is on a cracked disk. In such a circumstance, the accidental vibration will not ordinarily continue for an appreciable time but may continue sufficiently to actuate the instantaneously operating relay 21.

The function of the slow-acting relay 161 is to provide a time-delay element whereby the device to be ultimately actuated will not be operated in response to accidentally applied vibrations which may approximate the operating component. The slow-acting relay is calibrated to operate only after the instantaneously operating relay has closed the circuit 110 and maintained the circuit in closed position for a length of time sufficient

to actuate the slow-acting relay. In this way, the devices, controlled through the intermediary of the slow-acting relay, will not function in response to vibrations accidentally initiated in the system and which may approximate the operating component in response to which it is desired to have the operable device react. It is only when the operating component is definitely continued for a length of time sufficient to actuate the slow-acting relay that the device ultimately controlled is effected.

In the system shown in Figure 11 of the drawings, the slow-acting relay 161 is connected to operate the pawl and ratchet device through the pawl actuated relay 169, so that each time the relay operates, the ratchet wheel will be advanced a predetermined amount and will, in turn, advance the member 179.

The member 179 comprises, in the illustrated embodiment, a switch arm which travels a path to bring it in engagement successively with a plurality of contacts 181, controlling a plurality of circuits to be switched. These circuits, in turn, may be utilized directly to control a number of devices to be actuated, or may be utilized to operate additional pawl and ratchet devices or equivalent switching means, which, in turn, control additional circuits or devices to be operated or controlled.

Numerous other arrangements may be employed for utilizing the slow-acting relay in controlling a plurality of external circuits for the operation of controllable devices. Obviously, a plurality of slow-acting relays may be actuated by a single relay 21.

The actuating system illustrated in Figure 11 of the drawings is adaptable for controlling window and other display operating devices; for actuating a color organ comprising a plurality of ever-changing shifting lights; for operating the various instrumentalities hereinafter mentioned and described in more particular detail, and numerous other instrumentalities as will be apparent to those skilled in the art of controlling operative devices.

Our present invention has more practical applications. It may be incorporated with a picture display device in order to deliver a lecture or suitable music and, at the same time, cause the picture displayed by the device to change at the proper time during the lecture or accompanying music. This is accomplished simply by having the picture-changing mechanism actuated by the relay 21, that is to say, whenever the operating component occurs in the record 11, the picture will be changed.

The picture display device may be of any type, for instance the ordinary automatic stereopticon or slide projector comprising devices for presenting a series of slides or pic-

tures in position for display, or may be a still film projector, that is to say, a device employing cinematograph film having pictures photographed in the successive frames of the film and mechanism for advancing one frame at a time and allowing each picture frame to remain in display position until the picture-changing mechanism is again actuated to advance the next frame into displaying position.

The apparatus and method of our invention may also be used in art museums to actuate picture-illuminating means in conjunction with the reproduction of a lecture concerning the pictures, which lecture may be delivered or broadcast from a centrally located loud speaker or speakers, the pictures being successively illuminated in order to render them highly visible as they are described during the progress of the lecture.

The invention may also be utilized to effect a practical automatic demonstration of any mechanical device requiring demonstration, as, for instance, in a shop window or elsewhere, in conjunction with the delivery of a lecture or explanatory talk, the operation of the demonstrated device being controlled through the relay or relays 21 in order to occur at the proper time during the course of the lecture. The control of the operation of the device being demonstrated and the lecture both originate from the pickup 15 or its equivalent.

In the projection of talking-moving pictures, it is frequently necessary, in order to obtain dramatic effects, to dim the lights of the theatre, to vary the volume of sound emitted by the loud speakers, or to control other effect producing devices at intervals during the visual or picture sequence. Such control operations may be accomplished automatically, by means of our invention, by impressing upon the sound track of the cinematograph film an operating frequency component at intervals and utilizing this component in accordance with our invention heretofore described in order, by means of the relays 21, or their equivalent, to actuate a control device for dimming the theatre lights, increasing the amplification of the system through which the sounds are broadcast, or controlling other devices for producing sensory effects during the progress of the picture sequence.

In accomplishing the volume control, it is preferable to utilize suitable switch means for progressively increasing or decreasing the amplification in order to effect the control gradually. With this type of switch, we prefer to utilize two relays 21, one relay sensitive to an operating component having one frequency for advancing the switch, the other relay being sensitive to an operating component having a different frequency. By applying a succession of operating compo-

nents of one frequency, on the sound track, the volume control switch may be progressively advanced to any extent at any time during the progress of the picture of the sequence and by interposing operating components of the other frequency, the volume control may be reduced by progressive steps at any time during the projection of the picture.

It is also possible to actuate warning signals and perform other control functions such as the starting of auxiliary projectors at intervals during the progress of the talking picture in response to actuating components impressed directly on the sound track and without interrupting the sound or picture sequence. Such warning signals may be located in the manager's office, the box office, or at other locations in the theatre in order to advise the manager, or the box office as to the progress of the picture being displayed. Operating components impressed on the sound track may also be utilized to warn the operator of the projection machine at intervals in order that he may take proper action to ensure the projection of the successive reels at the proper time, that is to say, near the end of the first reel, the sound track may be arranged to give a "make-ready" warning so that the next reel may be mounted in a second machine ready for projection or may be made ready for mounting in the same machine if only one is used in the theatre, and an operating component may be used to automatically start the second machine in operation at the proper time.

Numerous other useful applications will suggest themselves to those familiar with the practical aspects of the projection of talking pictures in particular and the operation of devices in conjunction with the reproduction of sound generally.

It is thought that the invention and numerous of its attendant advantages will be understood from the foregoing description and it is obvious that numerous changes may be made in the form, construction, and arrangement of the several parts without departing from the spirit or scope of our invention, or sacrificing any of its attendant advantages, the forms herein described being preferred embodiments for the purpose of illustrating our invention.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is as follows:

1. Apparatus including a pickup device for picking up vibrations which have a normal sound component and an actuating component, and means associated with the pickup device for differentiating between the components, said means being adapted to apply the sound component to operate a sound-ing device in response to the sound component and the actuating component to operate

a separate device sensitive to the actuating component.

2. Apparatus comprising a pick-up for picking up vibrations which have a normal sound component and actuating component, means associated with the pickup to reproduce the sound components as an audible sound sequence, a separate operable device and means to apply the device operating component to said operable device.

3. Apparatus for reproducing a normal sound recording from a single track containing both the normal sound recording and a device-operating recording, and means for differentiating between the sound recording and device-operating recording and to apply the device-operating recording to actuate a relay.

4. Apparatus comprising a pickup device, means operatively associated with the pickup device for reproducing, as sound, vibrations made effective in the pickup device, a relay, and means operatively associated with the pickup device for actuating the relay in response to operating vibrations made effective in the pickup device.

5. Apparatus comprising a pickup device, means operatively associated with the pickup device for reproducing, as sound, vibrations made effective in the pickup device, a plurality of operating circuits and means operatively associated with the pickup device for selectively controlling the circuits in response to operating vibrations made effective in the pickup device.

6. Apparatus comprising a pickup device, means operatively associated therewith for reproducing, as sound, vibrations made effective in the pickup device, operating means to display a series of visual effects in conjunction with the sound sequence and means operatively associated with the pickup device for actuating the operating means in response to control vibrations made effective in the pickup device.

7. In combination, a plurality of pictures adapted for display, picture changing means operable to present the pictures sequentially in position for display, means to reproduce a sound sequence in conjunction with the display and including a record from which the sound sequence is produced, control means formed and arranged in the record, and means operated by the control means for actuating the picture-changing mechanism at predetermined intervals during the production of the sound sequence.

8. Apparatus comprising a pickup device adapted to be vibrated in accordance with a composite wave form, means including a loud speaker associated with said pickup device for emitting a sound sequence from the loud speaker in accordance with vibrations made effective in the pickup device, a display device for visually displaying pictures,

operating means for actuating the display device, and actuating means operatively connected with the pickup and the operating means to actuate the latter during the emission of the sound sequence.

9. Apparatus comprising a pickup device, means operatively associated with the pickup device for reproducing, as sound, vibrations made effective in the pickup device, control means for controlling the intensity of the sound sequence so reproduced, and means operatively associated with the pickup device and sensitive to control vibrations made effective in the pickup device for actuating the control means in response to control vibrations made effective in the pickup device.

10. In a talking moving picture machine including apparatus for projecting a picture sequence and a synchronized sound sequence from a record, the combination of an operable device for controlling the operation of the machine, and means actuated from the sound record itself for operating the operable device.

11. In a stationary picture display in combination with a plurality of pictures for display, illuminating means to illuminate each picture, means including a pickup to reproduce a sound sequence comprising an explanatory talk, or music, or both from a record thereof within the hearing of persons observing the pictures, and means associated with the pickup for selectively actuating the illuminating means at intervals during the reproduction of the sound sequence.

12. In a display, the combination of a device or devices to be actuated, operating means to actuate the devices, means including a pickup to reproduce, from a suitable sound record, a desired sound sequence, and means, actuated by control vibrations initiated in the pickup by the sound record itself, for controlling the operating means in synchronized relation with the sound sequence reproduced.

13. Apparatus comprising a pickup device, means operatively associated with the pickup device for reproducing, as a sound sequence, vibrations made effective in the pickup device, a relay, means operatively associated with the pickup device for actuating the relay in response to operating vibrations made effective in the pickup device, a circuit controlled by said relay, a slow acting relay in said circuit and means operable by the slow acting relay for actuating or controlling operable devices or circuits in timed relation with respect to the reproduced sound sequence.

14. The combination of a pickup adapted to receive vibrations including both a sensorial component adapted to be transformed to produce a moving sensorial effect and an actuating component, means operatively associated with the pickup and sensitive to the

70

75

80

85

90

95

100

105

110

115

120

125

130

sensorial component for producing a moving sensorial effect in response to the sensorial component and an operable device sensitive to the actuating component and operatively associated with the pickup and adapted to be operated in response to the actuating component.

15. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, and a relay, sensitive to the actuating component, associated with the pickup.

16. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, a relay, sensitive to the actuating component, associated with the pickup, and means controlled by the relay for controlling the means producing the sensorial effect.

17. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, a relay, sensitive to the actuating component, associated with the pickup, signalling means, and means controlled by the relay for actuating the signalling means.

18. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, a relay, sensitive to the actuating component, associated with the pickup, theatre lights, and means controlled by the relay for energizing the theatre lights.

19. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, a relay, sensitive to the actuating component, associated with the pickup, means for producing audible effects, and means controlled by the relay for actuating said means.

20. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, a relay, sensitive to the actuating component, associated with the pickup, a

movable device, and means controlled by the relay for actuating the movable device.

21. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, a relay, sensitive to the actuating component, associated with the pickup, an operable display device, and means controlled by the relay for actuating the device.

22. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, and a relay, sensitive to the actuating component, associated with the pickup, said relay being connected to the pickup through filter means adapted to pass to the relay only the operating components.

23. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, a relay, sensitive to the actuating component, associated with the pickup, and an amplifying system for the operating component.

24. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component, and an actuating component; means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect; a relay, sensitive to the actuating component, associated with the pickup, said relay being connected to the pickup through filter means adapted to pass to the relay only the operating components, and means to amplify the operating component.

25. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, a relay, sensitive to the actuating component, associated with the pickup, and means to rectify the operating component.

26. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component

as a sensorial effect, a relay, sensitive to the actuating component, associated with the pickup, said relay being connected to the pickup through filter means adapted to pass to the relay only the operating components, and means to rectify the operating component.

27. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, a relay, sensitive to the actuating component, associated with the pickup, and means to amplify and rectify the operating component.

28. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect and a relay, sensitive to the actuating component, associated with the pickup, and means to amplify, rectify, and filter the operating component.

29. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means, operatively associated with the pickup and operable to reproduce the sensorial component as a sensorial effect, a relay, sensitive to the actuating component, associated with the pickup, and an electric circuit having a switch controlled by said relay.

30. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect and a relay, sensitive to the actuating component, associated with the pickup, and a device operatively associated for actuating said relay.

31. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and a plurality of inter-distinguishable actuating components, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, and a plurality of relays operatively connected to the pickup and sensitive each to an actuating component whereby the relays may be selectively actuated from the pickup device.

32. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup and operable to reproduce the sensorial component as a sen-

serial effect, means forming a plurality of electrical circuits, selectively operating switch means operatively associated with the circuits, and a relay sensitive to the actuating component and operatively associated with the switch for actuating the switch.

33. The combination of a pickup, means to simultaneously impress upon the pickup, vibrations including a sensorial component and an actuating component, means operatively associated with the pickup, and operable to reproduce the sensorial component as a sensorial effect, means forming a plurality of electrical circuits, progressively operating switch means operatively associated with the circuits, and a relay sensitive to the actuating component and operatively associated with the switch for actuating the switch.

34. The combination of a pickup adapted to receive vibrations including a sensorial component and an actuating component, means operatively associated with the pickup and sensitive to the sensorial component for producing a sensorial effect in response to the sensorial component and an operable device associated with said means for regulating the production of the sensorial effect, said device being sensitive to the actuating component and in order to regulate the production of the sensorial effect in response to the operating component.

35. The method of controlling the operation of an operable device sensitive to control vibrations in conjunction with the reproduction of sensorial effects from equivalent sensorial vibrations, which comprises producing composite vibrations including the control vibrations and the sensorial vibrations, transforming the sensorial vibrations to create the sensorial effect and applying the control vibrations to the operable device.

36. The method of operating a device sensitive to vibrational operating components in conjunction with the reproduction of recordable sensorial vibrations from a record comprising vibrations corresponding to the sensorial effect and vibrational operating components which comprise reproducing the recorded vibrations and transforming the reproduced sensorial vibrations to provide the sensorial effect while simultaneously applying the operating components to the device to be operated.

In witness whereof, we have hereunder subscribed our names.

JOHN ELLIOTT JENKINS.
SAMUEL E. ADAIR.