Nov. 19, 1963 S. S. CRAMER 3,111,057

MEANS FOR PROVIDING VARIABLE LIGHTING EFFECTS

Filed April 14, 1959 3 Sheets-Sheet 1

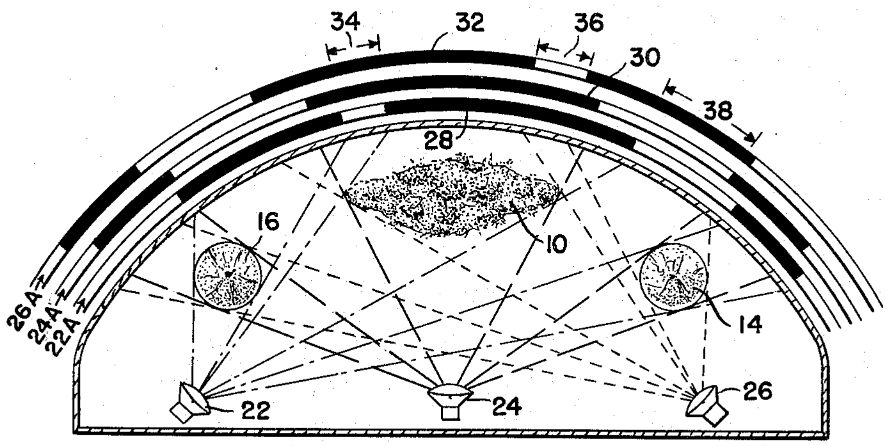

FIG. 2.

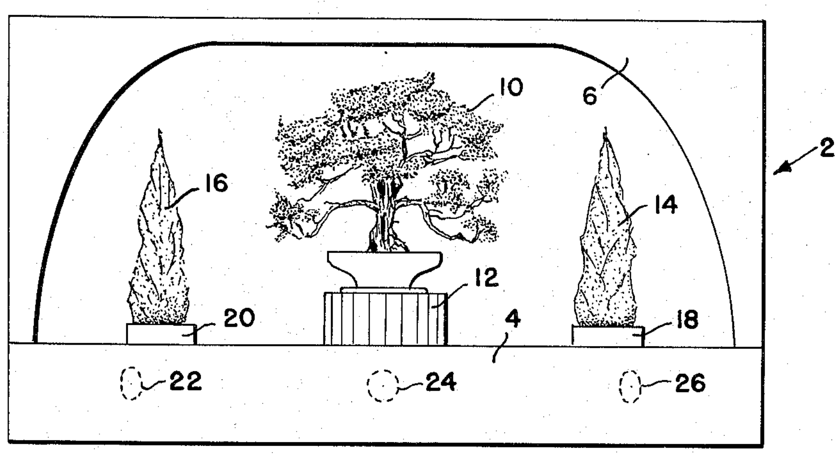

FIG. 1.

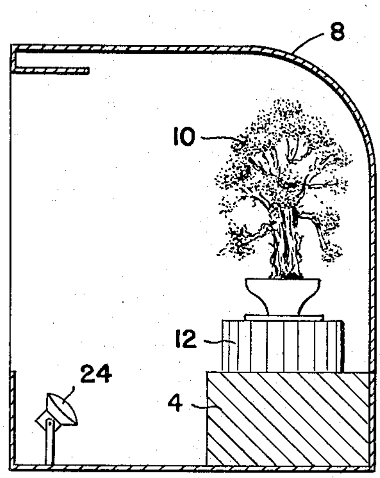

FIG. 3.

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MEANS FOR PROVIDING VARIABLE LIGHTING EFFECTS

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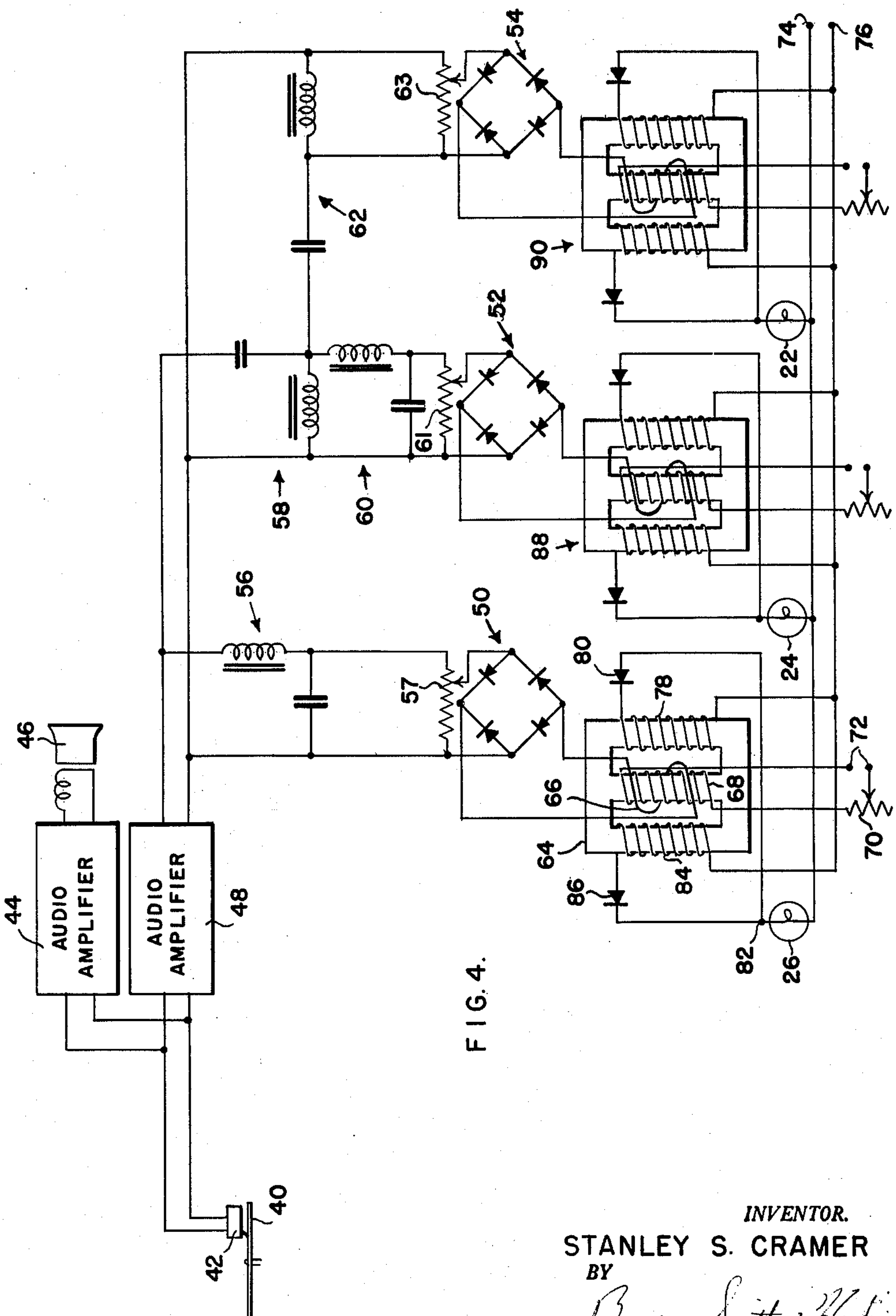

FIG. 4.

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Nov. 19, 1963 S. S. CRAMER 3,111,057

MEANS FOR PROVIDING VARIABLE LIGHTING EFFECTS

Filed April 14, 1959 3 Sheets-Sheet 3

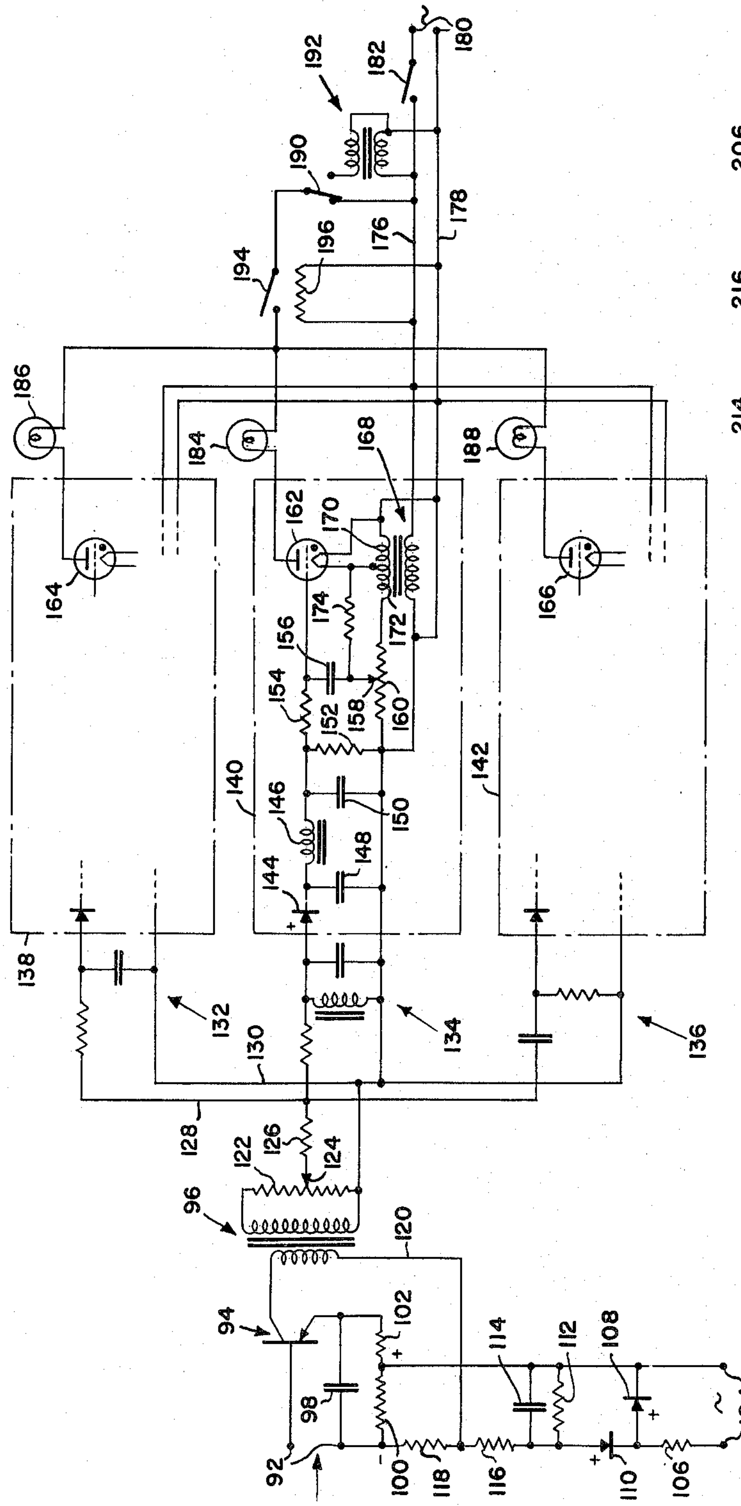

FIG. 5.

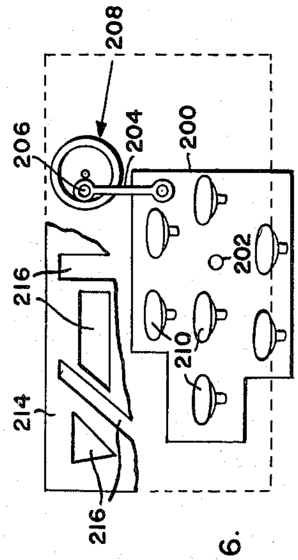

FIG. 6.

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MEANS FOR PROVIDING VARIABLE LIGHTING EFFECTS

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Filed Apr. 14, 1959, Ser. No. 806,333
16 Claims. (Cl. 84—464)

This invention relates to means for providing variable lighting effects and has particular reference to the production of such effects in synchronism with music though the invention is applicable to the production of color effects without musical accompaniment.

Various proposals have been made for so-called "color organs" designed to produce color effects either with or without synchronized musical accompaniment. Generally, these attempts have involved either manually controlled sources of colored light or sources of various colors controlled in intensity and in accordance with frequencies appearing in music, the intensity of illumination being a function of the amplitude of the frequency band corresponding to each color.

The general object of the present invention is to provide means of this general type involving various desirable features for the production of optimum aesthetic results.

In accordance with the invention what may be considered a background has located in front of it various light-occulting elements, the elements and background being illuminated by spaced color sources with the result that the several sources throw shadows on the background to provide umbral and penumbral areas which are devoid or deficient in light from one or more of the sources while being exposed more or less to light from one or more others. Under these conditions with a physically static system a play of variable colored areas is produced in pleasing fashion giving rise to a most unusual effect. Still further effects may be produced by imparting movements to the illuminated areas, most simply by movements of the light sources.

Another aspect of the invention has to do with what might be best described as inertial effects involving somewhat slow or lagging building up and fading out of colors. This end is desirably accomplished by using lamp sources of filament type in which the filaments are of such type as to heat or cool relatively slowly with variations of exciting current. The lags involved, however, are only of the order of fractions of a second but the results apparent to the eye involve "soft" changes of intensity which are particularly pleasing as contrasted with such changes as would tend to give what might aptly be described as a scintilating effect. For example, a series of percussion sounds, such as drum beats, do not appear when translated into color as sudden individual intensity changes dying out between the beats, but rather as step increases of color without substantial fading between beats as they follow each other at close intervals.

Further objects of the invention have to do with the attainment of the results indicated and relate to particular arrangements and apparatus for the production thereof.

The foregoing and other objects will become apparent from the following description read in conjunction with the accompanying drawings in which:

FIGURE 1 is a front elevation of a shadow box which may be provided in accordance with the invention in both small and large installations;

FIGURE 2 is a transverse section through the shadow box of FIGURE 1 on a plane which may be regarded as sloping upwardly toward the rear from a set of lamps providing illumination, there being also indicated in this

figure in graphical fashion areas of illumination provided on the rear surface of the shadow box;

FIGURE 3 is a vertical section through the shadow box of FIGURE 1;

FIGURE 4 is a wiring diagram showing the nature of one form of electrical apparatus involved in securing the desired results;

FIGURE 5 is a wiring diagram showing another form of electrical apparatus which may be used and which involves thyratrons, said diagram including a desirable form of preamplifier; and

FIGURE 6 is a diagram showing a typical means which may be utilized for varying the lighting effects by imparting movements thereto.

As will be pointed out hereafter, the invention is applicable to many particular settings but for convenience will first be described with reference to a shadow box 2 which forms, in effect, a stage which may be associated with a phonograph, or the like. As shown, the box 2 has its front provided wtih a lower barrier 4 to shield from view a series of lamps, which barrier is surmounted by a proscenium arch 6, the box being otherwise enclosed by a wall 8 which may be curved to provide top, back and side surfaces as will be clear from FIGURES 1, 2 and 3. The inside surface of this wall may be merely white and smooth, or, if desired, it may have an irregular suitably artistic form. Located in front of this wall there are various light-occulting objects such as indicated at 10, 14 and 16 which may be mounted on pedestals such as 12, 18 and 20. These objects could be floral or tree arrangements, statuettes, or other devices at the disposal of the artist. The bases may be constructed with various degrees of transparency depending upon the wishes of the artist who may set up a pleasing arrangement.

Adjacent to the front barrier 4 are lamps 22, 24 and 26 which are disposed in one of the fashions later described. In a small installation there may be only three of these lamps which in the order of their numerals may provide red, green and blue illumination. In larger installations the lamps of the various hues may be multiplied though, as will become apparent, it is desirable that they should not be so multiplied as to provide substantially uniform illumination of the background taking into account the occulting elements which are involved.

Assuming that there are only the three sources 22, 24 and 26 illustrated which desirably have the individual basic colors which by addition lead to an approximation of white illumination, the situation provided is desirably the following:

Each lamp is so disposed that, with respect to the light-occulting objects such as 10, 14, and 16 and their bases, each lamp would throw a substantial shadow on the background of the shadow box. If the lamps constituted point sources there would be an umbra cast for each of these objects. More usually, however, the sources would not be point sources, being provided by filaments and reflectors providing sources of substantial area, so that each light-occulting object will provide a shadow having both umbral and penumbral portions. At the top of FIGURE 2 there are indicated graphically, disregarding penumbra, approximate shadows cast by the objects 10, 14 and 16 on the back wall of the shadow box by the various lamps in the plane forming the section. In the graph 22A, the black portions indicate the shadows cast by the lamp 22, and in the graphs 24A and 26A, respectively, the black portions at 30 and 32 indicate the shadows cast respectively by the lamps 24 and 26. If it were assumed that all of the lamps were illuminated, it will be evident that the background in the vicinity of the plane indicated would involve areas some of which receive illumination from only one lamp, others of which receive illumination from combinations of the lamps, others of which receive illumination from all three of the lamps, and still others of which receive illumination from none of the lamps directly, though some illumination would generally occur due to reflections from other surfaces. For example, over the extent indicated at 34 illumination would be from lamp 22 only, the illumination from lamps 24 and 26 being cut off. Similiarly, in the region indicated at 36 the illumination would be from lamp 26 only. In the region indicated at 38 the illmination would be from lamps 22 and 24. In the central region directly behind the object 10 there would be no illumination directly from any of the lamps. On the other hand, at the forward and end portions of the rear wall there would be areas of illumination from all of the lamps. Actually, of course, if the interior of the shadow box use a matte white surface there would be indirect illuminated from all of the lamps to some degree so that there would be no deep unilluminated shadows. Penumbral effects serve to soften the shadow edges. While the graphical illustration in FIGURE 2 of the areas of illumination provided on the rear surface of the shadow box is unidimensional, it will be evident that in reality the actual configuration of the shadowed regions corresponding to individual lamps will be two-dimensional and quite irregular in shapes if the objects such as 10, 14 and 16 are themselves irregular.

Considering the geometrical aspects of the arrangement which has just been described it will now be evident that even with a simple arrangement such as that shown there will be a very elaborate play of shapes and colors produced as the lamps 22, 24 and 26 vary in their intensity of illumination. As will become evident from the description of the electrical aspects of the apparatus hereafter, the intensities of illumination vary greatly and substantially individually with the result that due to addition of the colors in various proportions colors of substantially the entire spectrum will be produced with apparent changes of both colors and shapes in the illuminated areas on the back wall of the box. At some times one or the other of the colors will be predominant. Desirably, though not necessarily, the play of colors varies in synchronism with music.

Referring now to FIGURE 4, which shows one form of apparatus which may be used, music reproducing means are conventionalized as a record 40 with which is associated a conventional pickup 42, providing audio signals. These audio signals may, however, be produced in any other fashion such as from a wire or tape recorder, from a radio receiver, from film, or the like. The audio signals are desirably fed to a pair of amplifiers 44 and 48, the former being a conventional audio amplifier, which may be provided with automatic volume control, and which feeds its output to a loud speaker indicated at 46 to provide music in the region of the observer of the shadow box. More elaborately, a stereophonic type of sound reproducing system may be used. The second audio amplifier 48 may be of conventional type but is desirably not provided with automatic volume control since intensity changes are of particular interest in securing the desired visual effects.

The output from the audio amplifier 48 is fed to a set of rectifiers 50, 52 and 54, shown in the form of bridge rectifiers, which supply control for the respective lamps 26, 24 and 22. Filter arrangements indicated at 56, 58, 60 and 62 are interposed between the amplifier and rectifiers to deliver to them selectively frequency bands which may be regarded as associated with the several colors. For example, the filter 56 provides a low frequency band to the rectifier 50 for control of the blue lamp 26. The filters 58 and 60 provide an intermediate frequency band to the rectifier 52 for control of the green lamp 24. The filters 58 and 62 provide a high frequency band to the rectifier 54 for control of the red lamp 22. Individual potentiometers 57, 61 and 63 serve for the control of

the inputs to the several rectifiers to secure the most desirable proportioning. The frequency bands which are supplied to the rectifiers are not critical and it has been found that excellent results may be secured by causing the filter 56 to provide for control of the blue lamp 26 audio frequencies up to about 200 cycles per second, with the filters 58 and 60 providing for control of the green lamp 24 frequencies in the range from about 200 to 1,000 cycles per second, while the filter 58, 62 provides for control of the red lamp 22 frequencies ranging upwardly of 750 cycles per second, for example, up to about 3,000 cycles per second constituting a fair practical limit of good electrical intensity.

Control of the lamps is effected through the use of saturable reactors which may be readily made capable of control of large powers with low input powers from the rectifiers. The saturable reactor 64 associated with the control of lamp 26 may be described in some detail. The reactor itself may be conventional and is provided with a control coil 66 receiving direct current from the rectifier 50. The core leg carrying the coil 66 carries a second coil 68 through which a bias current may be caused to flow from direct current supply terminals 72 under control of a variable resistance 70. This arrangement is to provide some minimum flow of current through the lamp 26. Supply of current to the lamp 26 is from the alternating current supply terminals 74 and 76, for example, at 110 volts, the current from the terminal 76 being divided between coils 78 and 84 which are connected through the respective rectifiers 80 and 86 to the same lamp terminal 82. This arrangement provides a full wave to the lamp but segregates the positive and negative half cycles in the saturable reactor windings to prevent asymmetric polarizing effects. As will be evident from FIGURE 4, the saturable reactors 88 and 90 associated with the respective lamps 24 and 22 contain windings having the arrangements just described.

The audio signals from the amplifier 48 will variably effect illumination of the lamps in dependence upon their frequency contents. A signal having a major low frequency component will produce illumination of the blue lamp 26 to a considerably greater extent than illumination from the lamps 22 and 24, and so on. As has already been noted, the lamps are desirably of types having relatively heavy filaments such as involve some time lag in heating upon the onset of current and likewise some time lag in cooling upon interruption of current. This is highly desirable for the most pleasing effects since then the changes in illumination are relatively gradual, leading in particular to step-like changes in intensity with repetitions of signals such as those resulting from percussion instruments. With adjustments of the potentiometers 57, 61 and 63 and of the variable resistances 70 the ranges of illumination changes may be brought to the most desirable values and if desired changes may be made depending upon the type of music or other audio signals which are fed to the lamp controls.

There may, however, be provided additionally scintillating effects using one or more lamps of low thermal inertia which may be energized by signals of relatively steep wave fronts in addition to the color effects already described.

An alternative circuit of the control of colored lamps is illustrated in FIGURE 5 which also shows a preamplifier which may be used in advance of the thyratrons and following audio amplification.

The audio signals which are to provide the variable illumination of the lamps are introduced at the terminals 92, from a conventional audio amplifier corresponding to 48 of FIGURE 4, to provide an input to the transistor preamplifier indicated at 94. This desirably comprises a power transistor connected in a common emitter type of circuit. Output is provided through an impedance matching transformer 96. The preamplifier has special characteristics for its intended purpose and these involve the power supply so that that will now be described. A large capacitor 98 connects the emitter to the input terminal companion to that connected to the transistor base. It will be assumed that the terminals 92 are connected for direct current flow through the secondary of an impedance matching transformer to provide a direct current connection. A pair of resistors 100 and 102 in series with each other shunt the capacitor 98. Alternating power supply terminals are indicated at 104 and may be connected to the usual 110 volt, 60 cycle line. A resistor 106 is connected to one of these terminals and between its end and the other terminal there is connected a diode 108 arranged to pass the half cycle which is not utilized to provide the transistor power. Beyond this is the rectifier 110 followed by the parallel arrangement of a resistor 112 and a large capacitor 114 to provide a direct current supply. The negative terminal of this supply is connected through the series arrangement of resistors 116 and 118 to the left hand end of the resistor 100, while the positive terminal of this supply is connected to the junction of the resistors 100 and 102. The junction between resistors 116 and 118 is connected through line 120 to one terminal of the primary of transformer 96, the other terminal of which is connected to the transistor collector.

Whereas for high fidelity reproduction a preamplifier used for sound purposes is desirably linear, that is not the case here. The proper and desirable control of illumination by audio frequencies in accordance with the present invention involves the necessity for compressing the range of control very substantially as compared with the range of audio intensities from which the control is derived. At the same time, visual changes in illumination should follow variations in low intensity audio signals. From an overall standpoint, starting with original audio frequency signals of low intensity, variations of these in the low intensity range should produce perceptible changes in illumination, whereas as intensity of the original signals increases, the variations of intensity should become proportionately less. Stated from the standpoint of amplifiers in general, the amplification with increase of input signal intensity should go into a saturation region. In the case of the use of a transistor stage such as that just described, using, for example, a power transistor of the 2N301 type the desired situation may be produced by utilizing, in particular, resistors 116, 118, 100 and 102 as illustrated to provide a limiting action on the maximum currents which may flow through the transistor elements during operation. While different transistors with inherently different characteristics will, naturally, require different circuit constants, the transistor of type 2N301 just mentioned may have resistors of approximate values as follows to secure the desired conditions of operation: resistor 102, two ohms; resistor 100, twenty-seven ohms; resistor 118, forty-seven hundred ohms; resistor 116, one ohm. These values are consistent with a capacitor at 98 having a capacity of five hundred microfarads. The resistor 106 using the nominal 110 volt alternating current supply may have a resistance of one thousaind ohms. The choice of rectifying diodes 108 and 110 is rather arbitrary, but for example, they may be of the type 1N91. Considering the characteristics of the transistor and the circuit arrangement described, it will become evident that whereas the amplification for low intensity signals is high, the amplification progressively decreases as the input signals become more intense, the operation passing into a saturation region with highly intense signals so that variations in these have decreased effect on the output. The foregoing is required not merely for asthetic effect, with which, however, it is thoroughly consistent, but because the illuminating system will accept only a relatively small range of signal variation as compared with the very large range involved in ordinary music.

The signals are delivered from the secondary of transformer 96 to the resistance 122 of a potentiometer, the adjustable contact 124 of which may be shifted to control the "volume." This contact is connected through resistor 126 to one input line 128 of the several thyratron control circuits, the other input line being indicated at 130.

For the several color channels there are provided the frequency selective filters 132, 134 and 136 which correspond in function to the filters already described in connection with FIGURE 4. The filter 132 is provided to have a peaked response in a lower frequency band for control of blue illumination; the second filter 134 provides peaking at somewhat higher frequencies for control of the green illumination; the filter at 136 provides peaking at still higher frequencies for control of the red illumination. The bands involved may be as discussed above. While simple filters are indicated at 132, 134 and 136, it will be evident that they may be respectively replaced by equivalent filters well known in the art. For present purposes, however, broad pass bands may exist and consequently elaborate filters are quite unnecessary.

The respective filters feed thyratron control circuits 138, 140 and 142, respectively. Since these are identical in construction, only one need be detailed and described, and for this purpose that at 140 has been chosen in FIGURE 5. The input from the filter is rectified by a diode 144, and the rectified signal is fed to a filter circuit comprising the arrangement of choke 146 and capacitors 148 and 150. However, while this in one sense a filter, the values of its elements are not chosen as they would be to secure a pure D.C. supply as in a conventional power supply, but are chosen to have a relatively low time constant so that the direct output of the filter will nevertheless vary substantially in response to quick changes in audio intensity. For example, choice is made so that quite perceptible changes in output will be individually indicative of a series of eighth notes. What the filter does, therefore, is merely substantially remove the ripple resulting from rectification of the audio frequency input.

The capacitor 150 is followed by a network which includes the resistors 152 and 154, arranged as illustrated, in conjunction with the capacitor 156, the lower terminal of which returns to the adjustable contact 158 of a potentiometer 160. A thyratron 162 chosen in accordance with the power which must be controlled in the lamps associated therewith, has its control grid connected to the junction of resistor 154 and capacitor 156. The corresponding thyratrons in the other control circuits are indicated at 164 and 166.

Considering further the thyratron 162, its filament (or heater, depending on its type) is provided with current from the portion 170 of the secondary of transformer 168 which is provided with current from the commercial alternating current supply line. Another portion 172 of the secondary winding is arranged to provide alternating bias of the thyratron control grid, and for this purpose is connected to one end of the potentiometer resistance 160. A connection between the adjustable potentiometer contact 158 and one terminal of the filament or heater includes a resistance 174, and this and the associated network serve to provide an alternating bias potential which is shifted out of phase with the anode potential of the thyratron to provide variable periods of firing in accordance with conventional thyratron control practices. The thyratrons used are desirably of the type involving negative grid control, i.e., arranged to fire when the grid is negative with respect to the cathode.

By the use of the input circuitry described, high stability of operation of the thyratron may be secured consistently with rapid response to variations in the audio signals.

The primary of the transformer 168 is connected across the lines 176 and 178 extending to the power supply input terminals 180, the main switch 182 being interposed. To make the same unit suitable for control of quite different intensities of illumination, it is desirable to supply current to the thyratron anodes through an alternative switching arrangement indicated at 190, which provides, alternatively, either the line voltage or a higher voltage provided by connection to the secondary of a transformer 192, the arrangement illustrated being such that low voltage is supplied when the switch 190 is in its left hand position and higher voltage when it is in its right hand position. To provide the usual delay in application of high voltage to the thyratrons after current is first supplied to their cathodes, there is interposed in the anode supply circuit a time delay relay comprising the switch element 194 and the heater element 196, such an arrangement being conventional.

The respective thyratrons supply current through lamps indicated at 184, 186 and 188. While in each case a single lamp is shown, it will be evident that other lamps may be paralleled with these, the number of lamps and their current requirements being correlated with the use of suitable thyratrons.

The operation of the lamps selectively at the different frequencies and in accordance with intensities of input signals is generally similar to that described in more detail above with reference to FIGURE 4, though in connection with the circuit shown in FIGURE 5 there enters the matter of operation of the preamplifier which compresses the signals as already described. The intensities of illumination depend upon the magnitude of the positive signals supplied to the thyratron grids, firing taking place earlier in the positive half cycles of the anodes as the positive signals increase. Adjustment is made at potentiometer 160 in the case of each control circuit so that, under ordinary operation, the respective lamps are just on the point of being visibly illuminated upon receipt of the weakest signals. This, of course, requires that the thyratrons should fire even in the absence of signals so that at such times threshold currents will flow through the lamps to bring them to the verge of visible illumination. Adjustment for this purpose is provided by the potentiometer contact 158. By this same adjustment there may be provided accentuation of each color with reference to the others.

FIGURE 6 illustrates a mechanical arrangement which may be used to provide slow variations of the colored shadow patterns which may be produced. This may take various detailed forms, but as shown in FIGURE 6 comprises a platform 200 mounted on a vertical pivot 202 and arranged to be oscillated about a vertical axis by a link 204 connected to a crank pin 206 driven by a motor 208 which may be of a type incorporating gearing between its rotor and output shaft so as to drive the latter at a relatively slow rate. Lamps 210 to produce illumination in the various colors as heretofore described are mounted on the platform 200. The arrangement to the extent so far described may be used alone, and in such case the variable positionings of the lamps upon oscillation of the platform 200 will provide changes in the umbral and penumbral areas so that in a shadow box arrangement or the like as previously described there will be a continuously changing pattern of the illumination on which pattern there are, of course, produced the variations in color and intensity such as previously discussed. Desirably the oscillation is at a slow rate, considerably slower than the beats of the music. For example, a complete oscillation occurring in a period of several seconds has been found quite desirable. In such case, considering the patterns produced by the music itself there is little evidence of the superimposed cycle of oscillation of the lamps. Rather, the effect on the observer is merely that of continuous changing of the patterns produced, and there may be in some instances an apparent slow swaying of the objects such as trees or the like which cast the shadows and are themselves variably illuminated.

Still further effects may be produced if spaced above the lamps there is a screen or mask such as 214 provided with variously arranged openings such as 216 which in themselves control the areas illuminated by the lamps. Desirably, the screen or mask is provided in a position a relatively short distance above the lamps so that only very diffused images of the openings 216 will be cast. The illuminated areas thus resulting will shift around during the oscillation of the platform 200 and coupled with the variations of angles of the rays from the lamps with respect to the shadow-casting object intricate and continuously varying patterns result.

The uses of the invention may be greatly varied. As has been pointed out, it is desirable that the lamps and light-occulting means should be so arranged that well defined light areas and shadows are produced on the surface which is viewed. If more than individual sources for the various colors are used, they should desirably be located in conjunction with shadow casting means to take this into account, particularly if the invention is applied to large enclosures such as ball rooms, skating rinks, or the like. In such cases the light-occulting means may take the form of masks located in the vicinity of the lamps to throw shadows. However, irregularities in the surface of the area to be colored may be provided to secure the desired shadow regions. Thus there may successfully be used considerable numbers of lamps of each of the different colors in order to illuminate a large area of walls, ceilings, or floors, without giving rise to a condition in which very large extended areas would be illuminated in all of the colors with the resulting production of rather uninteresting effects. Conventional theater stages or motion picture screens may, of course, provide the areas to be illuminated. Small shadow boxes of the type described herein may be provided in conjunction with radio receivers, television receivers, or phonograph reproducers, including coin operated music reproducing devices.

It may be noted that a relatively small shadow box of the type described may be used for producing color effects which may be photographed with accompanying recording of sound, the resulting photographic film being then used in conventional motion picture theater projectors to provide large scale color effects in conjunction with music during, for example, preshow or intermission periods.

While the invention is particularly applicable to the production of color effects in synchronism with audible music, it will be evident that the color effects may be produced from records which may be scored independently of audible music, or which may be scored in association with music but solely for color effects. For example, a magnetic tape may be provided with two associated channels one of which provides music and the other of which provides color effects only, synchronizing with the music, but with the color effects not dependent upon the frequency components of the music, the color effect channel carrying "sound" signals, i.e., of different frequencies, which, in themselves, may not be pleasing to the ear.

It will be evident that the invention may be applied in numerous fashions within the scopes of the appended claims.

What is claimed is:

1. In combination, an extended surface, at least three lamps having filaments of high thermal inertia, said lamps respectively providing red, green and blue illumination, means mounting said lamps in spaced relationship relative to each other and to project illumination on a common extended area of said surface, a plurality of spaced objects between said area and said lamps arranged to obstruct rays from said lamps and disposed to provide a plurality of subareas disposed throughout said area to receive, selectively, direct illumination from individual lamps only, from combinations of said lamps and from none of said lamps, means providing an audio frequency electrical output, selective filtering means providing from said output low, intermediate and high frequency outputs, and means controlled respectively by the last mentioned outputs to control individually the illumination from said lamps.

2. The combination according to claim 1 in which the red illumination is controlled by said high frequency output, the green illumination is controlled by the intermediate frequency output, and the blue illumination is controlled by the low frequency output.

3. The combination according to claim 1 in which the means providing an audio frequency output comprises a reproducer and an amplifier receiving an input from the reproducer.

4. The combination according to claim 3 including a second amplifier receiving an input from the reproducer and providing an output of sound audible to observers of said extended area.

5. The combination according to claim 4 in which said second amplifier has automatic volume control while the first mentioned amplifier does not have such control.

6. The combination according to claim 1 in which the last mentioned means comprises saturable reactors for control of currents to said lamps and rectifiers receiving said outputs and providing direct controlling currents to said saturable reactors.

7. In combination, at least three lamps having filaments of high thermal inertia, said lamps providing red, green and blue illumination, means mounting said lamps in spaced relationship relative to each other and to project illumination in a common region, means in said common region disposed to provide adjacent areas to receive, selectively, direct illumination from individual lamps only and from combinations of said lamps, means providing an audio frequency electrical output, selective filtering means providing from said output low, intermediate and high frequency outputs, and means controlled respectively by the last mentioned outputs to control individually the illumination from said lamps.

8. The combination according to claim 7 in which the red illumination is controlled by said high frequency output, the green illumination is controlled by the intermediate frequency output, and the blue illumination is controlled by the low frequency output.

9. The combination according to claim 7 in which the means providing an audio frequency output comprises a reproducer and an amplifier receiving an input from the reproducer.

10. The combination according to claim 9 including a second amplifier receiving an input from the reproducer and providing an output of sound audible to observers of said extended area.

11. The combination according to claim 10 in which said second amplifier has automatic volume control while the first mentioned amplifier does not have such control.

12. The combination according to claim 7 in which the last mentioned means comprises saturable reactors for control of currents to said lamps and rectifiers receiving said outputs and providing direct controlling currents to said saturable reactors.

13. The combination according to claim 1 in which the last mentioned means comprises thyratrons for control of currents to said lamps and rectifiers receiving said outputs and providing direct controlling currents to said thyratrons.

14. The combination according to claim 7 in which the last mentioned means comprises thyratrons for control of currents to said lamps and rectifiers receiving said outputs and providing direct controlling currents to said thyratrons.

15. The combination according to claim 1 including means for continuously varying at a slow rate positions of at least one of said lamps.

16. The combination according to claim 7 including means for continuously varying at a slow rate positions of at least one of said lamps.

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