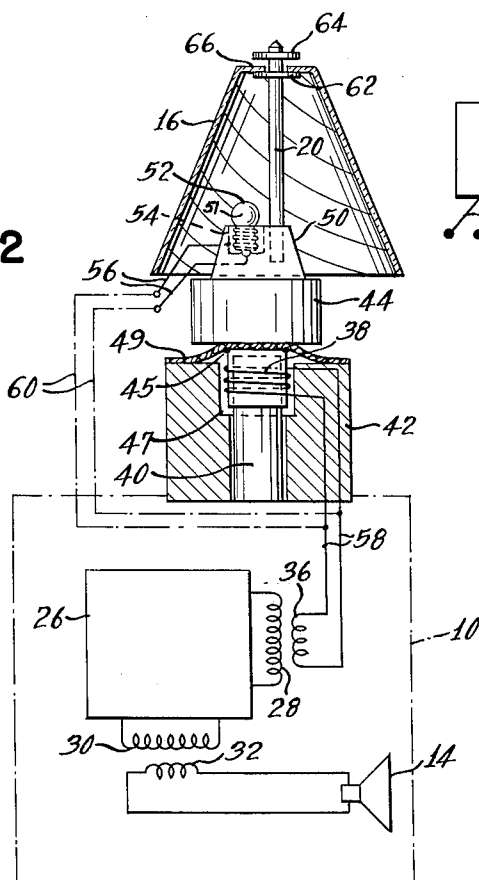
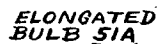


3,205,755

Filed Nov. 27, 1963

$$\begin{array}{r} \times 2650 \\ \times 2655 \end{array}$$


INVENTOR
Lawrence A. Sklar
BY *Wayne C. Jacobbe*
AGENT

1

3,205,755

PRODUCTION OF COLORED LIGHTS FROM AUDIO IMPULSES

Lawrence A. Sklar, New York, N.Y., assignor to Audio-motor Corporation, Bronx, N.Y., a corporation of New York

Filed Nov. 27, 1963, Ser. No. 326,584
9 Claims. (Cl. 84-464)

The present invention relates to the production of colored lights from audio impulses and more particularly to a combination of means suited to the production of a display of colored lights which changes in random response to audio impulses.

In the past it has been known to employ audio amplification means to produce physical and mechanical excitation for diverse purposes. The telephony art is replete with examples of such usage. Likewise, those skilled in the optical arts have produced numerous methods and means for achieving a moving display of colored lights for various utilitarian and esthetic purposes. Unfortunately, the systems in the prior art are complex and consequently economically unattractive for most consumer or even commercial applications.

It is, therefore, an object of the present invention to provide an extremely uncomplicated and inexpensive means for producing a moving display of colored lights responsive to audio impulses which overcomes and eliminates the difficulties in the prior art. The further objects and advantages will become apparent to those skilled in the art from the following description and disclosure.

The aforementioned objects are generally accomplished in accordance with the present invention employing for the most part standard equipment and materials such as an audio amplifier, for example, such as the amplifier found in a standard AM radio unit which is electrically interconnected with the voice coil of at least one speaker unit by means of a standard step-down transformer. For the purposes of the present invention the same amplifier is equipped, for example, with a second step-down transformer comprising a primary and a secondary coil. The secondary coil is placed in a simple series circuit with an oscillation producing assembly such as, for example, a standard voice coil unit which has been especially adapted for the purposes of the present invention by removal of the speaker diaphragm from the tube upon which the coil is wound. It has been discovered in the practice of the present invention that by rigidly attaching a piece of light-weight, rigid, plastic foam material of suitable thickness to the tube upon which the voice coil is wound, the relatively small amplitude oscillations of the voice coil can be magnified to an extent which is ideally suited for the purposes of producing the lighting effect of the present invention. That is to say, that the oscillations and vibrations produced in the rigid foam material are neither too great to require reduction by extrinsic means or too small to require further amplification. A light-weight elongated vertically disposed support member, e.g., a glass drinking straw, rigidly attached to the foam material is employed to transmit the vibrations produced in the foam to a system of light filters arranged, for example, on a light shade which is movably attached to an upper portion of the support member. The movable attachment of the colored light shade to the support allows

2

the shade to undergo restricted random movement which is responsive to the movement of the support member. In this arrangement the quantum of random motion communicated to the light shade is ultimately responsive to the output of the audio amplifier. In order to provide the desired display of constantly changing colored lights, a standard light bulb having an incandescent filament and placed in a socket which is connected to suitable power supply means is rigidly attached to the foam material at a point adjacent to the support member. The colored light shade is positioned so that it forms a substantial enclosure around the light filament. As the light shade is set into motion responsive to the output of the audio amplifier the light rays emanating from the filament project through the colored filters onto a suitable screen. The screen is preferably constructed of at least partially transparent material and preferably envelopes the aforementioned assembly at a locus of points remote therefrom so that a light magnification effect is achieved. When the audio amplifier of the above described system is employed to amplify and to produce music, for example, through the standard speaker means, a display of colored lights is achieved by means of the specially adapted voice coil in combination with the rigid foam means, support means, light filament, light shade means movably attached to the support means, and light screen means, which display will be constantly changing in apparent response to the frequency and amplitude of the music.

For a better understanding of the present invention reference is now had to the figures of the drawing.

FIGURE 1 is an isometric sketch showing a preferred combination and illustrating the optical effect achieved by means of the present invention.

FIGURE 2 illustrates diagrammatically in elevation one embodiment of means for producing random movement in a colored light shade responsive to the output from audio amplification means.

FIGURE 3 illustrates diagrammatically in elevation a modification of the embodiment illustrated in FIGURE 2.

Referring now to FIGURE 1, a standard AM or FM radio is enclosed in cabinet 10 having a speaker 14 situated in cabinet wall 11. The novel combination of means for producing a display of colored lights, shown in the cutaway, is positioned on upper flat surface 15 of cabinet 10. The novel means includes a retaining means 42 which is the housing for a vertical oscillation producing means, e.g., a standard audio voice coil wound upon a rigid tube movably mounted within the retaining means to permit vertical movement. The vertical oscillation producing means and voice coil (not shown) of speaker 14 are electrically inter-connected to separate output coils of the same audio amplifier of the radio in cabinet 10 through separate stepdown transformers. Alternatively, this assembly and coil 14 are connected in parallel to the secondary coil of the same transformer. A piece of rigid, light-weight plastic foam material 44, which is called a unitary-rigid vibration producing means, is rigidly attached to an upper part of the vertical oscillation producing means mounted within 42. Incandescent or other suitable lighting means, hidden from view within light shade 16, and vertical support means 20, which means transmits the vibrations from the foam to shade 16, are rigidly attached to foam material 44 at a point which is hidden from view within light shade 16. Light shade 16 is movably mounted on an upper portion of a support

means 20 such that it will undergo restricted random movement with respect to support means 20, i.e., it will move freely a limited distance at any angle and revolvably with respect to 20. Transparent or at least partially transparent light screen 12, represented as being partially cut away, forms an envelope which completely encloses the above described means on all sides, in this embodiment. The screen 12 is positioned on top of cabinet 10 and is secured thereto by means of overlapping flanges such as 17, and 19 extending from the bottom portion on all sides of screen 12. The remote wall 22 of light screen 12 is preferably constructed of reflective material such as aluminum foil, for example. The screen 12 can be made from polymethyl methacrylate, glass or other suitable material which is clear or preferably frosted to hide the assembly and yet allow passage of light to permit viewing of the colored light effect from a point outside of the envelope formed by the screen.

In the operation of the present means, vibrations are induced in support 20, and such motion is communicated to colored light shade 16 which entertains random motion about 20. The incandescent lighting means within light shade 16 directly projects light, e.g., through colored light filters of shade 16, to the front, side, and top faces of screen 12, the direct effect being enhanced by reflection from wall 22. Since the light filters on shade 16 are in motion and change their position with respect to screen 12 and the incandescent source, the intensity and color of the light impinging on any given point of screen 12 continually changes. A colored light display is produced which is responsive to the frequency and amplitude of the audio impulses produced by the audio amplifier (not shown) contained within cabinet 10. Since the sound reproduced in speaker 14 is likewise responsive to the frequency and amplitude of the impulses produced by the same amplifier, the illusion of colored lights changing with the tempo of music, for example, emanating from speaker 15 is thus simply and effectively achieved.

FIGURE 2 illustrates one embodiment of a preferred form of the means of the present invention for producing random motion in colored light shade 16 responsive to the frequency and amplitude of impulses from audio amplifier 26. The numeral 26 represents an audio amplifier which may be of any known construction. In this embodiment primary coils 28 and 30 are shown associated with the output of amplifier 26. It is to be understood, however, that depending upon the power output of the amplifier any desired number of coils and transformers may be associated with the amplifier in order to operate a plurality of speakers and/or light display mechanisms. The primary coil 30 is shown positioned in flux relationship with secondary coil 32 which is electrically interconnected to the voice coil of speaker 14 or to other suitable audio reproducer means. It is to be understood that speaker 14 may be physically located in a standard AM or FM radio, phonograph, television, public address system, juke box, or other suitable audio devices.

Primary coil 28 is shown positioned in flux relationship with secondary coil 36 which is electrically interconnected in a simple series circuit with voice coil 38 by means of leads 58. Voice coil 38 is wound on a tube 45, which is constructed of light rigid material, e.g., nylon, cardboard, or other strong, non-magnetic material. The coil 38 and tube 45 comprises an assembly which is situated around magnetic means 40, which can be a permanent or an electro-magnet, and in close association therewith. This assembly is movably set within groove 47 in retaining means 42 such that when the current in coil 38 is changed by a change in the output of the audio amplifier 26, thereby producing a corresponding change in the magnetic field between the magnetic means 40 and coil 38, rapid vertical oscillation is imparted to the voice coil 38 and tube 45 assembly. A cloth mesh 49, or other suitable means communicating between retaining means

42 and tube 45 is preferably provided to prevent the dislodging of tube 45 from groove 47.

It has been discovered in the practice of the present invention that the rapid motion of relatively minor amplitude imparted to voice coil 38 and tube 45 can be physically magnified by means of a mass of rigid lightweight plastic foam material which is rigidly attached to tube 45. The foam also serves to absorb mechanical chatter. Suitable foam materials are, for example, polyurethane and polystyrene. A block 44 of such rigid foam material, which in this case is polystyrene of about 1/2 inch thickness and one-inch in diameter is shown rigidly attached to the upper portion of tube 45. Polystyrene foam was chosen because of its low specific gravity, dimensional stability, and low vapor absorption characteristics. The rigid attachment can be achieved by mechanical means although it is preferred to use a layer of bonding agent, e.g., glue or household cement. In this embodiment, a second block of the same foam material 50 having about the same thickness as 44 but somewhat diminished in horizontal dimensions is shown situated on and rigidly attached to the top of block 44. In this case, foam blocks 44 and 50 form rigid unitary means for producing vibrations from the oscillations of tube 45. An incandescent light bulb 51 with a filament 52 is attached to socket 54 which is imbedded in foam block 50 as shown in the cross section. The power employed to excite the filament 52 is drawn through leads 56 from any suitable power source such as household current. In one modification, the power employed to excite filament 52 may be derived from secondary coil 36 by interconnecting leads 56 with leads 58 by means of leads 60 shown by means of broken lines on the drawing. When such a connection is made not only does the motion imparted to the system through coil 38 and tube 45 depend upon the output of audio amplifier 26 but also the intensity of light emanating from 52 changes with a change in the output of the amplifier. It should be noted that in this system it is preferred to employ a low wattage filament to the end that only a small amount of heat will be generated in the system. A 10 watt filament has been successfully employed. If, however, relatively large wattage filaments are desired, the heat produced may be removed by means of a blower or other suitable heat removal means.

Vertically elongated support member 20 is provided to transmit the vibrational motion of the foam blocks 44 and 50 to light shade 16. In this embodiment, the bottom portion of 20 is rigidly attached to socket 54 within foam block 50 which is preferred, although the member 20 may be rigidly attached to the foam itself. In this case the support member 20 is a glass straw about 1/4 inch in diameter and about 2 inches long equipped with two rubber washers 62 and 64 snugly fitted to an upper portion of the straw in spaced relation to one another. Rubber washers and like materials are chosen to prevent the production of mechanical chattering noise as shade 16 comes in contact with such material. Referring to FIGURE 3, it is to be understood that the function performed by member 20 can be performed by a specially constructed bulb 51A positioned in socket 54 having an elongated upper portion resembling member 20 and likewise fitted with washers 62 and 64 or other suitable retaining means.

The top portion of shade 16 appears as two horizontal pieces approaching support 20 in the elevation view of FIGURE 2. In a plan view 66 would appear as a circularly shaped piece, e.g., about one inch in diameter having the central portion removed such that support 20 passes therethrough. The extent of vertical motion of 66 with respect to support 20 is restricted by washers 62 and 64 while lateral motion is limited to the tolerance between the central cut out portion of 66 and support 20. The shade 16 may thus move freely within the limitations thus imposed at any angle and revolvably about member 20. Shade 16 forms at least a partial enclosure

with respect to light filament 52 which is the light source. The light shade 16 represented in FIGURE 2 is a three dimensional figure, namely, a cone of revolution truncated by member 66 previously described above. The cone of revolution is composed of colored light filters, e.g., colored cellophane foil or any other suitable transparent or semi-transparent material arranged in any suitable design such as is hereinafter described with reference to the practice of this invention on the walls of shade 16 such that light is projected from filament 52 to a screen such as screen 12 shown in FIGURE 1. In practice of this invention green, blue, and red cellophane foils were attached to the upper, middle and bottom portions of the shade, respectively. The bottom diameter of the shade 16 is preferably left open to permit free and unrestricted movement of the shade. The design of a shade other than a cone of revolution, e.g., any geometrical figure which partially or completely envelopes the vibrating light source is contemplated within the scope of the present invention.

Many modifications and alterations of the present invention will become apparent to those skilled in the art and the present invention should not be unduly restricted by the specific examples of structure, materials, or dimensions hereinbefore set forth. For example, it is desirable under certain circumstances, e.g., in a large commercial application, to design a light filter means such as shade 16 of large dimensions to permit direct viewing of the light effect produced thereon. Moreover, tube 45 and foam blocks 44 and 50 can be constructed as a unitary vibration producing means. Many other modifications and alterations will become apparent without departing from the spirit and scope of this invention and the present invention should be limited only by the claims.

What is claimed is:

1. A system for producing a display of colored lights responsive to audio impulses which comprises in combination: audio amplification means, retaining means containing a magnet and forming the base for the assembly hereinafter recited, vertically disposed first rigid tubular means movably mounted around said magnet in said retaining means, coil means associated with said tubular means for producing vertical oscillation in said tubular means in co-action with said magnet responsive to an electrical output of said amplification means, unitary rigid means comprising a light weight plastic foam material for producing vibrational motion rigidly attached to an upper portion of said tubular means, light source means rigidly attached to an upper portion of said unitary means, support means rigidly attached to said unitary means for transmitting vibrational motion of said unitary means to light filter means, said light filter means being movably attached to said support means and forming at least a partial enclosure with respect to said light source means.

2. A system for producing a display of colored lights responsive to audio impulses which comprises in combination: audio amplification means, retaining means containing a magnet and forming the base for the assembly hereinafter recited, vertically disposed first rigid tubular means movably mounted around said magnet in said retaining means, coil means associated with said tubular means for producing vertical oscillation in said tubular means in co-action with said magnet responsive to an electrical output of said amplification means, unitary rigid means comprising a light weight plastic foam material for producing vibrational motion rigidly attached to an upper portion of said tubular means, light source means rigidly attached to an upper portion of said unitary means, support means rigidly attached to said unitary means for transmitting vibrational motion of said unitary means to light filter means, said light filter means being movably attached to said support means and forming at least a partial enclosure with respect to said light source

means, and at least partially transparent light screen means forming a partial envelope about said light filter means.

3. A system for producing a display of colored lights responsive to audio impulses which comprises in combination: audio amplification means, retaining means containing a magnet and forming the base for the assembly hereinafter recited, audio reproduction means responsive to an electrical output of said audio amplification means movably mounted around said magnet in said retaining means, vertically disposed first rigid tubular means, coil means associated with said tubular means for producing vertical oscillation in said tubular means in co-action with said magnet responsive to an electrical output of said amplification means, unitary rigid means comprising a light weight plastic foam material for producing vibrational motion rigidly attached to an upper portion of said tubular means, light source means rigidly attached to an upper portion of said unitary means, support means rigidly attached to said unitary means for transmitting vibrational motion of said unitary means to light filter means, said light filter means being movably attached to said support means and forming at least a partial enclosure with respect to said light source means, and at least partially transparent light screen means forming at least a partial envelope about said light filter means.

4. The system of claim 3 in which said audio amplification and audio reproduction means are at least partially contained in a common enclosure having a substantially plane upper surface, said tubular means is movably mounted in a housing means, said housing means being superimposed on said plane surface.

5. The system of claim 4 in which said light screen means forms an envelope with respect to said housing means, the lower portions of said envelope being contiguous with the periphery of said upper plane surface.

6. A system for producing a display of colored lights responsive to audio impulses which comprises in combination: audio amplification means, retaining means containing a magnet and forming the base for the assembly hereinafter recited, vertically disposed first rigid tubular means movably mounted around said magnet in said retaining means, coil means associated with said tubular means for producing vertical oscillation in said tubular means in co-action with said magnet responsive to an electrical output of said amplification means, unitary rigid means comprising a light-weight plastic foam material for producing vibrational motion rigidly attached to an upper portion of said tubular means, light source means rigidly attached to an upper portion of said unitary means, vertically elongated support means rigidly attached to said light source means for transmitting vibrational motion of said unitary means to light filter means, said light filter means being movably attached to said support means and forming at least a partial enclosure with respect to said light source means.

7. The system of claim 6 in which said light source means comprises an electrical socket, and an incandescent lamp comprising a filament and bulb disposed therein, said bulb being adapted by elongation of an upper portion thereof so as to constitute said support means for transmitting vibrational motion of said unitary means comprising a light weight plastic foam material to said light filter means.

8. A system for producing a display of colored lights responsive to audio impulses which comprises in combination: audio amplification means, audio reproduction means responsive to an electrical output of said audio amplification means, vertically disposed first rigid tubular means movably mounted in a suitable housing member for producing vertical oscillation in said tubular means comprising a first coil wound on said tubular means, a second coil in series circuit with said first coil, a third coil associated with the output of said audio amplification means and in flux relationship with said second coil,

7

said first coil being in flux relationship with magnetic means contained within said housing member, unitary rigid means comprising a light weight plastic foam material for producing vibrational motion rigidly attached to an upper portion of said tubular means, light source means rigidly attached to an upper portion of said unitary means, support means rigidly attached to said unitary means for transmitting vibrational motion of said unitary means to light filter means, said light filter means being movably attached to said support means and forming at least a partial enclosure with respect to said light source means.

9. The system of claim 8 in which said second coil is

8

electrically connected in said series circuit with said first coil and in parallel circuit with said light source means.

References Cited by the Examiner

UNITED STATES PATENTS

1,946,026	2/34	Lewis et al. -----	84—464
1,977,997	10/34	Patterson -----	84—464
2,150,854	3/39	Whidden -----	84—464
3,018,683	1/62	Way -----	84—464
3,048,075	8/62	Wright -----	84—464

LEO SMILOW, *Primary Examiner.*