

[54] **LIGHT DISPLAY**

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40/132 F, 133 A, 132 E, 130 L, 106.51,
106.52; 353/46; 179/1 VL; 340/148, 172;
317/123, 147; 240/10.1; 272/8 D, 8 P

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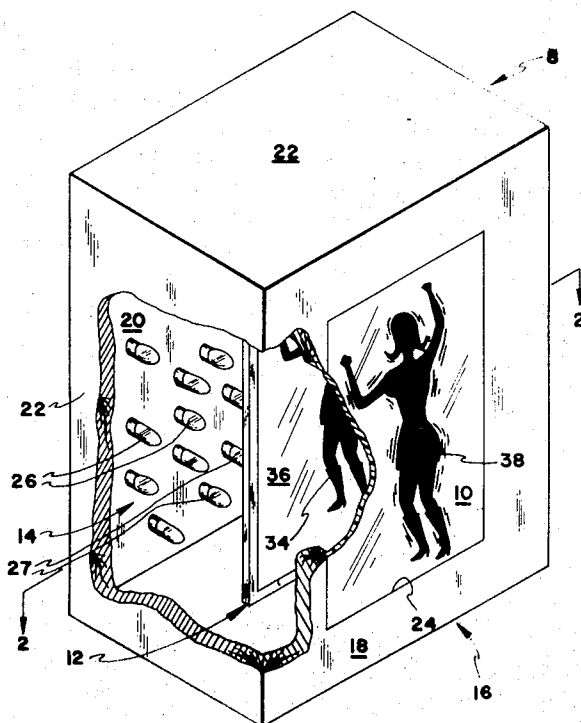
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[57]

ABSTRACT

A light display apparatus comprising a plurality of light sources controlled by circuitry and a display screen. The display apparatus can project images of an object onto the screen in several relative positions to create apparent motion in coordination with a sound wave signal. Illumination of the respective light sources is coordinated to respond to various amplitudes of a sound wave signal by contact structure placed in different actuated positions under control of divers voltage amplitudes of an output signal from an audio-amplifier.

5 Claims, 4 Drawing Figures



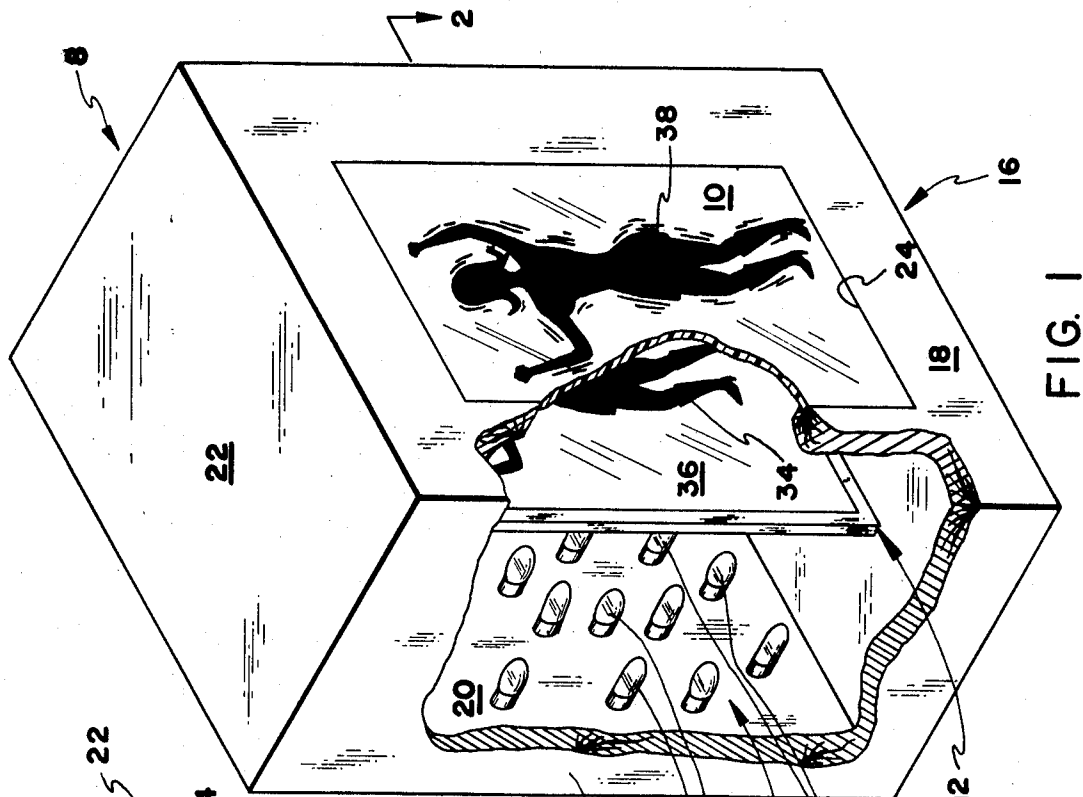


FIG. 1

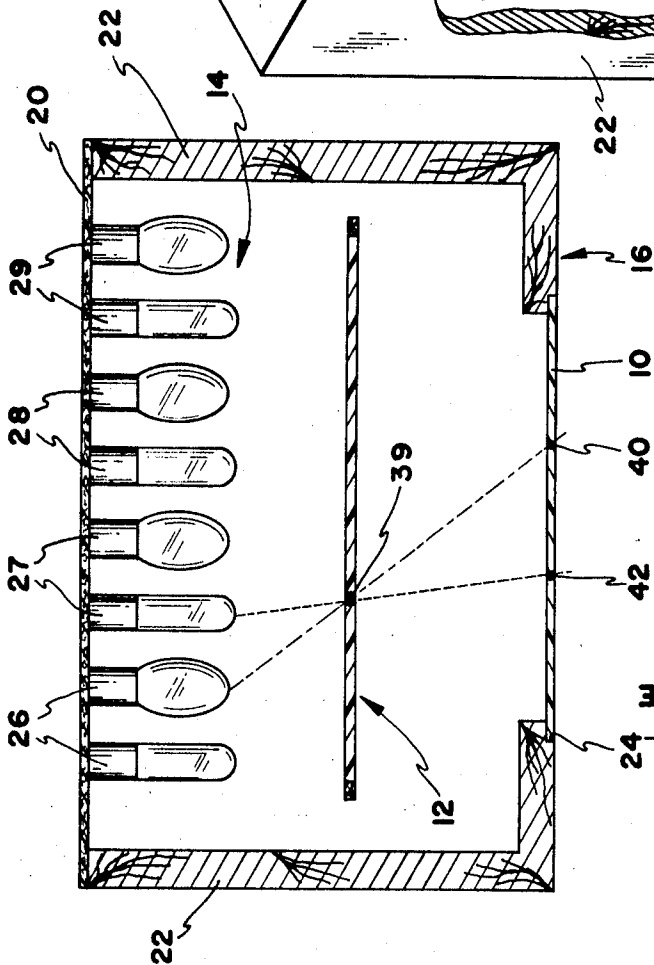


FIG. 2

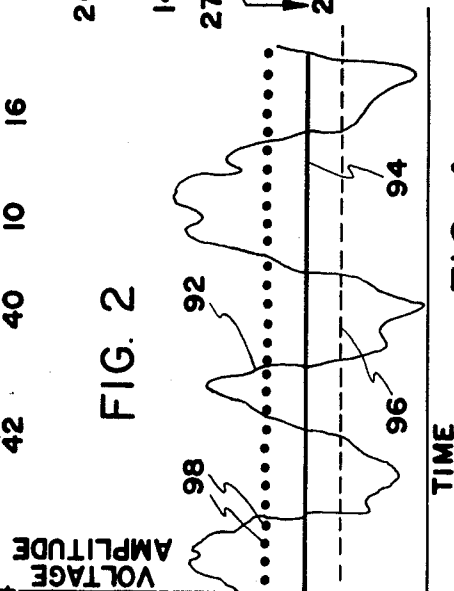


FIG. 4

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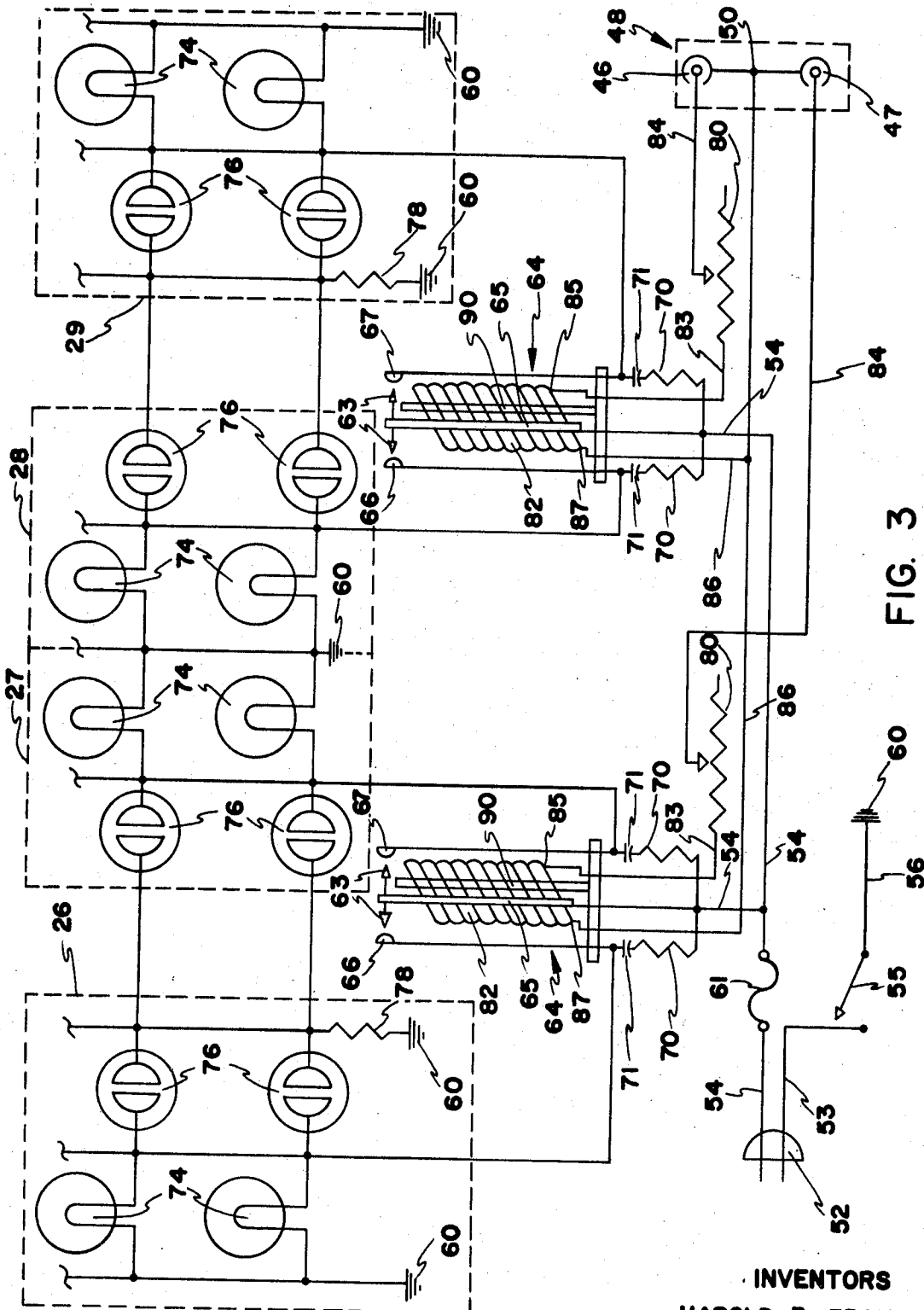


FIG. 3

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LIGHT DISPLAY

BACKGROUND

1. Field of Invention

This invention relates generally to apparatus for achieving a visual effect, and more particularly to light display apparatus for obtaining a visual effect in coordination with predetermined variations in the voltage level of an audio signal. 2. Prior Art

Many attempts have been made in the past to achieve a visual effect timed by music. To this end, various devices have been developed for projecting and blinking lights on and off at the same time music is played. Prior art blinking circuits effect fast attack and slow decay times, and are restricted to low wattage levels. Some of the devices of the prior art coordinate the light effect with the frequency of the music using lights and a control. The control includes such cumbersome means as tuning forks or complicated impedance-capacitance circuits which respond to specific frequencies to illuminate the lights. In order to provide the visual effect for the entire audio frequency range, several such forks or circuits are required. As a result, such device of the prior art are complex and expensive.

SUMMARY AND OBJECTS OF THE INVENTION

A sound wave signal may have variable frequency and amplitude characteristics. The present invention is adapted to utilize the varying amplitude of the sound wave signal to coordinate visual light effects with sound issuing from a speaker. The present invention, which comprises a plurality of light sources and control means, uses the sound wave signal, when in excess of a certain amplitude, to actuate various lights in coordination with audio issuing from a speaker which receives the sound wave signal.

The present invention is not only capable of achieving the effect of coordinating the light illumination with sound, but can generate displays in such a manner as to create apparent motion of an image. To this end, the present invention may include apparatus comprising light sources, an object and a screen. The light sources are illuminated in time relation one with respect to the other to respectively project an image of the object at different locations on the screen at different times. Thus, the illusion to the eye of motion is created.

It is a primary object of the present invention to provide novel apparatus which utilizes the varying amplitude of a sound wave signal to coordinate visual light effects with sound issuing from a speaker.

It is another significant object of the present invention to provide display apparatus for creating apparent motion of an object on a screen in time relation with audio issuing from a speaker.

These and other objects and features of the present invention will become more fully apparent from the following description and appended claims taken in conjunction with accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective representation of one presently preferred embodiment of the present invention;

FIG. 2 is a cross sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is one circuit diagram for carrying out the purposes of the invention;

FIG. 4 is a graph generally illustrating the manner in which the amplitude of the sound wave signal may selectively actuate light sources in time relation with an audio output.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

With reference to FIG. 1, the illustrated light display apparatus, generally designated 8 creates the illusion to the eye of a girl dancing to a musical output. The apparatus of FIG. 1 comprises a screen panel 10 and object panel 12 and a plurality of light sources, generally designated 14.

In this instance, a cabinet 16 houses the plurality of light sources 14, the object panel 12 and holds the screen 10 in a vertical, upright position. The cabinet is shown as being rectangular in form, having a front panel 18, a back panel 20 and two side panels 22 enclosing an interior volume. For convenience, one of the panels can be made movable (not shown) for access to the interior of the cabin 16. The front panel 18 is provided with an opening 24 which is covered by the screen 10. The screen 10 may be made of translucent plastic material.

The light sources 14, as shown, comprise sets of lights or lamps 26, 27, 28, and 29 (FIGS. 1 and 2), which are secured to the back panel 20 of the cabinet 16. The lamp sets 26, 27, 28 and 29 face toward the interior of the cabinet so as to illuminate the screen 10, when actuated. A control, hereinafter more fully described, is used to cause the lamp sets 26, 27, 28 and 29 to be selectively actuated in coordination with a sound wave signal.

Intermediate, the lamp set, 26, 27, 28 and 29 and the screen 10 is an object, which in this instance carries a dark figure 34 of a girl. Remainder 36 of the object panel 12 is preferably transparent or translucent so as to allow light to pass through. The object panel 12 may be secured by various means to one or more of the cabin panels and may be removable for replacement by other objects panels.

As is shown in FIG. 1, the projected image 38 on the image screen 10 appears to move as the light sources are selectively illuminated. The manner in which illumination is created can be best understood with reference to FIG. 2. For simplicity, only one point 39 of the object on the object panel 12 and a single ray of light from each of two lamps are shown. When the right lamp of the lamp set 27 is "on," the point 39 of the object 34 is projected on the screen 10 at location 40. When the left lamp of the lamp set 20 is "on," the point 39 of the figure 34 is projected onto the screen 10 at location 42. Thus, when an infinite number of points of the object 34 are shifted from a first position to a second position, etc., an optical illusion of object movement results. Also a three dimensional effect can be achieved by placing different ones of the light sources at different distances away from object panel 12.

As stated, the light sources 14 comprises various sets of lamps 26, 27, 28 and 29, which are electronically controlled by the amplitude of a sound wave signal to selectively turn "on" and "off" in coordination with an

audio output. The electronic control is best shown in FIG. 3. The illustrated circuit is electronically connected to a stereo amplifier, generally designated 48, having two channels 46 and 47 and a single ground 50.

The light sources are connected to the stereo amplifier 48 by a lighting circuit and a control circuit for each channel of the amplifier so that comparatively high wattage levels can be accommodated and fast attack and fast decay are achieved. For economy, where possible lead lines and ground lines are common for both the lighting and control circuits of the two channels of the amplifier 48.

Each light circuit is connected to a power source, such as a 110 volt outlet, by a plug 52 and lines 53 and 54. The line 53 is connected to the ground through an on-off switch 55 and a line 56.

The hot line 54 provides power to a hinged armature 65 of both spaced relays 64 across a fuse 61.

With continued reference to FIG. 3, the hinged armature 65 of each relay 64 is provided with a pair of contact points 63 at the distal end thereof. Each relay 64 also has two fixed contacts 66 and 67 which are selectively engaged by respective ones of the armature contact points 63. In the illustrated circuit, each armature 65 is biased mechanically by structure not shown toward the left contact 66 to complete the circuit between the left contact 66 and the left contact 63 of the associated armature 65.

A resistor 70 and a capacitor 71 are connected to the line 54 in parallel with the circuit formed by the associated armature 65, the contact 63 and the contact 66 or the armature 65, the contact 63 and the contact 67, so as to minimize arcing across the contacts 66 and 67 during operation.

Each incandescent lamp 74 and each neon lamp 76 of the lamp sets 26, 27, 28, and 29 are connected to grounds at 60, a voltage-reducing resistor 78 being interposed between each neon lamp 76 and ground. The voltage-reducing resistors 78 are sized so as to give the necessary voltage drop across the neon lamp for proper use.

Lamp sets 26 and 27 are wired in parallel to the hot lead 54 through the left relay 64 and lamp sets 28 and 29 are wired in parallel to the hot lead 54 through the right relay 64. When the armature 65 of both relays 64 is biased so that adjacent contacts 63 and 66 are engaged, lamp sets 26 and 28 will be illuminated. When the armature 65 of each relay 64 is biased so that adjacent contacts 63 and 67 are engaged, lamp sets 27 and 29 will be illuminated. Preferably, though not essentially, each armature 65 is normally biased mechanically in the direction of contact 66. However, when each relay 64 is appropriately energized, the armature 65 thereof will be electrically biased to close with the contact 67.

With continued reference to FIG. 3, the control circuits will now be described. The control circuits regulate the movement of each relay armature 65 in coordination with the voltage amplitude of a sound wave signal issuing from the stereo amplifier 48. Each control circuit comprises an amplifier terminal (at 46 or 47,) a variable resistor 80 and a trigger mechanism, which, in this instance, is in the form of one relay 64 and contacts 66 and 67. The trigger or relay comprises a heavy coil winding 82 and a core 90. The control cir-

cuit is duplicated for each relay 64. The input terminals and 46 and 47 are respectively connected to parallel hot lines 84 which in turn respectively join a variable resistor 80. Line 83 connects each resistor 80 to one end 85 of the heavy coil 82 of the right and left relays respectively. A common line 86 connects the other end of each coil 80 to ground at 50.

In operation, the sound wave signal from an audio device (not shown) received by the amplifier 48 becomes an audio stereo output through speakers (not shown) Each output signal varies in frequency and in magnitude in correspondence with the audio signal received by the amplifier. The signals at 46 and 47 causes a voltage to be impressed upon the control circuit of the right and left relays 64, respectively. This voltage causes a current to flow in the control circuit in question. When such current reaches coil 82, a magnetic flux is developed in core 90. The strength of the magnetic flux depends upon the magnitude of the current flowing in the associated control circuit and upon the voltage signal received from the amplifier 50. By increasing or reducing the resistance of the control circuit at variable resistor 80, the amount of current flowing in the control circuit in question for a given impressed voltage can be regulated. When the voltage is sufficiently high and the signal is large in amplitude or the resistance of the circuit is low, so that the signal strength is above the cutoff voltage amplitude selected by the user, sufficient current will flow through the associated coil 82 to cause the magnetic flux to pull the associated armature 65 toward the related core 90, causing the right contact 63 of the associated armature to engage contact 67. If such were to occur in the left relay 64, the lights of lamp set 27 would be illuminated and the lights lamp set 26 would be extinguished.

Each resistor 80, as mentioned, provides adjustment for varying the cut-off amplitude and may be pre-set for a particular signal magnitude so that for part of the time the current issued to the associated coil 82 is insufficient to move the related armature 65 to close contacts 63 and 67. Thus, contacts 63 and 66 would remain closed. However, during periods of voltage amplitude in excess of the cut-off, which could be on the order of 15 to 30 volts, the current in the coil is high enough to displace the armature 65 thereby closing contacts 63 and 67 and opening contacts 63 and 66. Accordingly, if such were to occur with respect to the right relay 64, the lights of lamp set 28 would be extinguished and the lights of lamp set 29 would be illuminated. Note that it is possible, depending upon the voltage output from respective terminals 46 and 47, to electrically bias both relays 64 for electrical communication through contacts 63 and 67, or to so electrically bias only one of the two relays 64 or to provide insufficient electrical bias so that electrical communication is maintained between contacts 63 and 66 at both relays.

The manner in which the lights are illuminated and extinguished by a relay 64, is graphically shown in FIG. 4. When the voltage amplitude of the output signal at 46 or 47 of the stereo amplifier 48 is above the variable cut-off amplitude at 94, the lights connected to the associated contact 67 are illuminated as represented by the portion of the signal 92 above the dotted line 98. When the amplitude of the wave 92 is reduced to cross the variable cut-off amplitude 94 into the region below

the amplitude designated by dashed line 96, the lights connected to the associated contact 66 are illuminated. By varying the setting of the associated variable resistor 80, the cut-off amplitude may be changed.

In any event, the operation of the present display is not effected by the frequency of the wave 92, but only by the amplitude thereof. The blinking of the various lights causes an interesting visual effect in precise time relation to the audio output of a speaker associated with the amplifier 48.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. Light display apparatus comprising light means, object means, and screen means, said object means being physically located intermediate the light means and the screen means, said light means having at least two laterally spaced light sources and comprising light circuit means and control circuit means, said light circuit means having a contact means operable by the control circuit means to any one of a plurality of effective positions, and the control circuit means comprising input terminals, trigger means, and resistant means,

said input terminal means being adapted to receive an audio-signal, said trigger means operating the contact means between positions when the trigger means are caused to be energized beyond a predetermined amplitude by the audio signal for consecutively illuminating the light sources to respectively cast light upon said object means in time relation to thereby project an image of the object means upon the screen means first in one position and then in another position so that the image appears to be in motion.

2. Light display apparatus comprising:

a pair of light sets,

relay actuated switch means operable in a first position to energize one of said light sets and operable in a second position to energize the other of said light sets,

an audio signal source having an output voltage, and relay means applying said output voltage to actuate said switch means.

3. The apparatus of claim 2 further comprising:

variable resistance means interposed between said audio signal source and said relay means for selecting the amplitude of said output voltage for actuating said relay means.

4. The apparatus of claim 2 further comprising:

means normally biasing said switch means to said first position.

5. The apparatus of claim 2 wherein:

said audio signal source is one channel of a stereo amplifier.

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