Oct. 21, 1969 W. E. TANDBERG 3,473,429

SOUND TO COLOR TRANSDUCER

Filed March 15, 1968

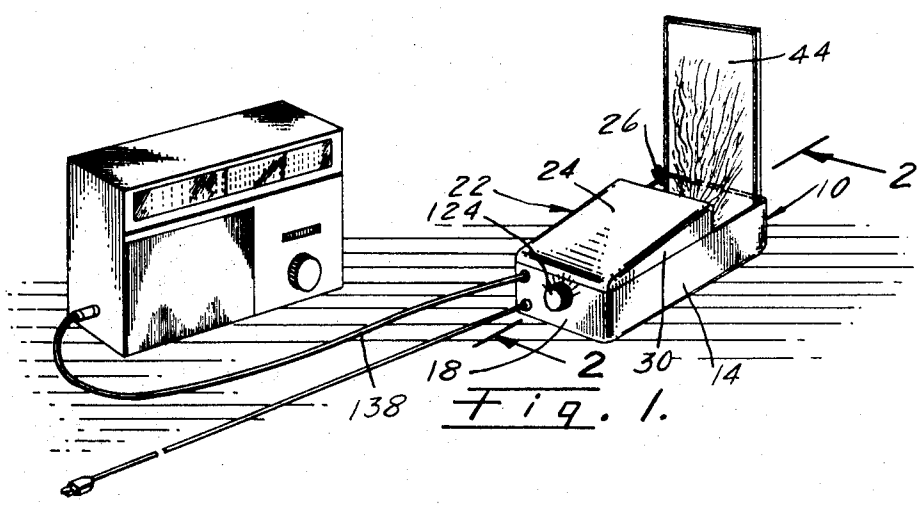


Fig. 1.

Fig. 2.

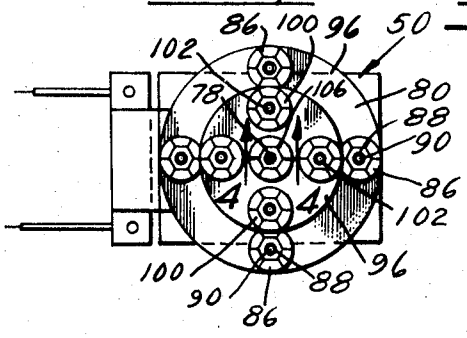


Fig. 3.

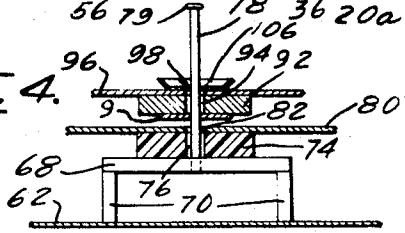


Fig. 4.

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United States Patent Office 3,473,429 Patented Oct. 21, 1969

3,473,429

SOUND TO COLOR TRANSDUCER

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Filed Mar. 15, 1968, Ser. No. 713,460
Int. Cl. A63j 17/00; G09f 19/02, 27/00
U.S. Cl. 84—464 12 Claims

ABSTRACT OF THE DISCLOSURE

A translator apparatus having light reflecting mechanism actuated by power from an audio system to effect a shifting and mixing of bright colored light instantaneously interpreting the music or speech source completely and with an extremely high degree of correlation.

BACKGROUND OF THE INVENTION

Field of the invention

The invention relates to transducer apparatus for converting audio vibrations into a colored light display.

Description of the prior art

Sound to color transducers or translators have been used to produce color displays of various types but these mechanisms have certain limitations, disadvantages, and problems, some of which are as follows: high initial cost and high maintenance cost, poor dynamic range, poor frequency response and transducer sluggishness (time lags), high power line consumption; high power drain from the audio source; and high moving mass.

BRIEF SUMMARY OF THE INVENTION

The present invention comprises apparatus having support discs carrying and supporting smaller colored discs which may be faceted. This apparatus is mounted on or operably connected with an electric variable vibration producing device. Specifically, the apparatus is mounted on the motor of a radio speaker, with or without a cone, and the motor is connected in parallel with the speaker of a radio.

A light is directed on the discs and is reflected onto a screen or other external optical system such as, for example, a projection system.

The faceted colored discs are loosely pivoted on the supporting discs which are also pivotally mounted. The vibrations produced by the speaker motor to which the apparatus is operably connected or mounted causes the various discs, both carrier discs and the faceted, colored discs to rotate and because of the loose mounting of the colored discs on the larger carrier discs the colored discs also vibrate and/or rock or rapidly move laterally simultaneously with the rotative movements thereof. The carrier discs do likewise.

An extremely interesting and fascinating color display is thus produced with the colors shifting and mixing with an extremely high correlation with rhythm intensity and pitch of the impressed audio input.

When referring herein to discs, it is to be understood that these parts may be round, square, concave, convex, or any other suitable shape.

OBJECTS, ADVANTAGES AND NOVEL FEATURES OF THE INVENTION

It is an object of the present invention to provide simple and inexpensive apparatus that solves the above pointed out problems, and overcomes said disadvantages and limitations.

It is another object of the invention to provide apparatus of this character having instantaneous following of the light effects as the sound changes.

It is still another object of the invention to provide apparatus of this character having an increase of the area of a particular color because of the rocking or the moving of the supporting discs and the colored discs.

It is a further object of the invention to provide apparatus of this character having frequency discrimination due to the coupling and mass of the moving parts.

It is a still further object of the invention to provide apparatus of this character having excellent dynamic range wherein the motor of the parts of the light reflecting mechanism depends on the magnitude of the audio vibrations. In other words the motion of the moving parts of the mechanism follows the music dynamics.

It is another object of the invention to provide apparatus of this character having light area multiplication due to the small light reflecting discs that can rock and rotate and slide or shift.

Still another object is to provide apparatus of this character that has low power consumption from the audio source.

The characteristics, advantages and novel features of the invention are further sufficiently referred to in connection with the following detailed description of the accompanying drawings which represent one embodiment. After considering this example, skilled persons will understand that many variations may be made without departing from the principles disclosed and I contemplate the employment of any structures, arrangements or modes of operation that are properly within the scope of the appended claims.

Referring to the drawings, which are for illustrative purposes only:

FIG. 1 is a perspective view of a transducer apparatus or system embodying the present invention;

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

FIG. 3 is a top plan view of the light reflecting and color mixing mechanism, and

FIG 4 is an enlarged sectional view taken on line 4—4 of FIG. 3.

Referring more particularly to the drawings, there is shown a sound to color transducer or translator, indicated generally at **10**.

There is a housing comprising a bottom **12**, side walls **14** and **16**, end walls **18** and **20** and a top cover or canopy, indicated generally at **22**, having a top wall **24** extending from one end of the housing part way to the opposite end, leaving an opening **26** adjacent said opposite end. As shown, the canopy extends from the end wall **18** and is inclined upwardly toward the opposite end. The canopy has an end wall **28** and side walls **30**, the lower free edges of said walls **28** and **30** having depending inner flanges **32** which extend along the inner side of the top edge portions of the end wall **18** and side walls **14** and **16** of the housing to retain the canopy in place on the top edges of said end wall **18** and side walls **14** and **16**.

End wall **20** has a thickened lower portion **20***a* the upper end of which forms a shoulder **20***b* from which depend upwardly opening bores **36**. There are a plurality of bores **36** spaced laterally apart although only one such bore is shown. These bores are for removable reception of pins **38** having upper end portions fixed in recesses **40** provided therefor in a horizontal lower frame member **42** of a frame for a screen **44**, the screen frame including vertical side frame members **46** and a top, horizontal frame member **48**. The screen **44** may be of any suitable material such as beaded glass, plastic or the like and preferably should be white or other suitable color. Edge portions of the screen are received in grooves provided therefor in the inner faces of the frame members **42**, **46** and **48**, as best shown in FIG. 2. Thus the screen is removably

mounted at the end of the housing at which the opening 26 is located.

Adjacent the wall 20 of the housing is a light reflecting and mixing mechanism, indicated generally at 50, said mechanism including means for effecting vibrations and indicated generally at 52. This means 52 is shown as a speaker driving motor of which there are various types on the market. One such speaker driving motor is manufactured by Jensen Manufacturing Company of Chicago, Ill., and includes a rectangular frame of suitable metal such as iron. Within the frame and between the lower and upper parts 56 and 58 of the frame 52 there is a voice coil 60. At the top of the frame is a centering device comprising a diaphragm 62 of fabric or other suitable material. The functioning of this part of the mechanism is well known.

There is a stage 68 which is supported on the diaphragm 62 by means of vertical support members 70. The stage and support members may be formed integrally or may be of separate pieces as shown in FIG. 2. The stage is attached to the upper ends of the support members 70 by any suitable means such as, for example, an adhesive or cement such as the well known epoxy cement. The lower ends of said support members are similarly secured to the top side of the voice coil form 62. These parts are of low mass and are of balsa wood although any other suitable material may be used.

Disposed on the top side of the stage 68 is a coupler 74 which may be of any suitable damping material. As shown the coupler 74 is of foam rubber or plastic or the like and has a vertical opening 76 therethrough through which a pin 78 extends, the lower end of said pin being fixed in the stage or otherwise suitably secured thereto. For example, the pin may be press fitted into the stage or it may be cemented thereto. Since the hole through the coupler is of greater diameter than the diameter of the pin the coupler may be considered a floating coupler. Coupler 74 may be of any other suitable low mass or light weight material such as balsa wood, for example.

There is a relatively large carrier disc 80 having an axial hole 82 therethrough, said carrier disc 80 being loosely mounted on pin 78, the axial hole 82 being of greater diameter than the diameter of said pin 78. Carrier disc 80 rests on the coupler 74.

Carrier disc 80 is also of very low mass being of a very light weight material such as aluminum, for example. It is desirable to have a dull upper surface for the carrier disc 80 and one finish for said surface is to flock said upper surface with black flock which is the surface finish disclosed herein. Alternatively a dull, flat black paint may be used or any other suitable material may be used.

Light reflecting colored discs 86 are mounted on the carrier disc 80, said discs 86 being of different colors or combinations of colors. These light reflecting discs may be of any suitable character and are of much smaller diameter than the diameter of the carrier disc 80. Light reflecting discs 86 have axial holes 88 therethrough in which pins 90 extend, the lower ends of said pins 90 being secured to the carrier disc by any suitable means such as being press fitted in openings provided therefor in said carrier disc. The pins may also be secured in such holes by cementing or the like. Colored light reflecting discs 86 are mounted adjacent the periphery of the carrier disc and are annularly spaced apart on said carrier disc, as best shown in FIG. 3. Any suitable number of light reflecting discs may be used, although four such discs are shown.

The holes of the light reflecting discs 86 are of somewhat larger diameter than the diameter of the pins 90 on which said discs 86 are mounted. Further, the discs 86 are dished with the central portions resting on the carrier disc 80. With this arrangement, the light reflecting discs will bounce, rotate, shift laterally and rock and gyrate on their respective pins 90 under the influence of the vibrations generated by the radio speaker driving motor 52. The colored light reflecting discs 86 are also faceted, as best shown in FIG. 3. While the discs 86 may be specially made it has been found that colored sequins of suitable size and shape function very satisfactorily. They have very low mass and gyrate and have all of the above described movements and motions. They not only rotate but they will rotate in one direction and then another.

Pin 78 has a flange 9 thereon spaced somewhat above the carrier disc 80 and on which rests a coupler 92 of harder material than the coupler 74. As described above, coupler 74 is of foam plastic, sponge rubber or any other suitable material, while coupler 92 is of harder material such as metal, for example, or it may be of hard plastic. Coupler 92 has an axial opening 94 therethrough for the pin 78, the opening 94 being of somewhat greater diameter than the diameter of pin 78 although it is to be understood that either or both couplers 78 and 92 may have openings that fit snugly on the pin 78.

Resting on coupler 92 is a second carrier disc, indicated at 96, which is smaller than the carrier disc 80 and which has an axial opening 98 therethrough for reception of the pin 78, opening 98 also being of somewhat greater diameter than the diameter of the pin 78 although not necessarily so. The diameter of the second, smaller carrier disc 96 is of such diameter as not to extend over or cover the light reflecting discs 86.

Carrier disc 96 also has a dull, upper surface which absorbs light rather than reflects it as with the carrier disc 80. Black flock is also used to coat the upper surface of carrier disc 96 although any other suitable finish or coating may be used as well as some other color.

Colored light reflecting discs 100 are mounted on the top of the carrier disc 96, said colored light reflecting discs being of the same character as the discs 86 on the larger carrier disc 80. Colored light reflecting discs 100 are mounted on pins 102 secured to the carrier disc 96 by the pins. Discs 100 are also loosely mounted on their respective pins by having the holes for the pins 102 of larger diameter than the diameter of said pins 102. The discs 100 are disposed adjacent the peripheral edge of the carrier disc 96 and there is a central light reflecting disc 106 mounted on pin 78 and resting on the carrier disc 96, the axial hole in the light reflecting disc 106 for reception of the pin 78 being of greater diameter than the diameter of the pin 78. The light reflecting discs 100 are variously colored and the central light reflecting disc 106 is also colored. However, the latter disc or any other light reflecting disc may be white, for example, instead of having some other color.

The speaker driving motor 52 is operably connected by wires 120 to a volume control device 122 of any well known character such as, for example, a rheostat, having an adjustment knob 124. The volume control device 122 is disposed within the housing and is secured to the wall 18 thereof by a screw 126 having one end screwed into a casing part 128 of the volume control device. The screw 126 extends through an opening provided therefor in said wall 18 and is secured to said wall by means of nuts 130 and 132 at the inner and outer sides respectively of said wall 18. Corresponding ends of wires 136 are connected to the volume control device 122, the opposite ends of said wires, which extend through a flexible conduit 138, are connected to a suitable source of power. In the present arrangement said wires are connected in parallel with the speaker of a radio receiving set 140.

A source of light is provided and comprises an electric light bulb or lamp 142 of well known character removably disposed in a socket 146 attached at its closed end to the upper end of a bracket 148, the opposite end of said bracket being secured to the bottom 12 of the housing by rivets 150 or by any other suitable means.

Light bulb 142 is positioned adjacent to the light reflecting and mixing mechanism 50 and higher than light reflecting and mixing mechanism and there is a light reflector, indicated generally at 152 at the side of the lamp

142 opposite the mechanism 50. Reflector 152 may be of any suitable shape to reflect light onto the light reflecting mechanism 50 but is shown as having a wall 154 attached at its upper end to the top wall 24 of the canopy 22 and adjacent the forward, free end of the canopy wall 24 by any suitable means such as, for example, rivets 156. Reflector wall is inclined downwardly and rearwardly and said reflector has side walls 158. The front of the reflector is open and the light 142 is disposed within the space defined by the walls 154 and 158 of the reflector. Electric light or lamp 142 is supplied with electric current by wires 160 which are disposed in a conduit 162 and said wires 160 are connected to any suitable source of electric power. A switch, not shown, may be interposed in one or both of the wires 160 whereby the light may be turned on or off.

There are many features and advantages of the invention both as to construction and functions.

The various driven parts have a low mass and respond instantaneously to vibrations so that there is instantaneous following of such parts with sound changes. Frequency discrimination is excellent and there is excellent dynamic range.

As described above the light reflecting discs rotate, rock, shift laterally, gyrate, counter rotate, bounce, and move at different rates and because of their motions there is an increase in area of particular colors. The carrier discs also rotate and have at least some of the actions of the sequins thereby adding to the area of reflected colors and mixtures of colors.

By using the mechanical cross over coupling and multiple discs a pitch or frequency discrimination is provided that is remarkably accurate. A mechanical decoupling principle is used that is simple and inexpensive.

By having a spacer or coupler that is relatively soft, such as foam material or the like, for one of the carrier discs and a spacer or coupler of harder material for the other carrier disc various effects are secured. The foam material acts as a decoupler in the system.

The flock surface of the carrier discs has certain advantages. It stops reflection, that is a light killer, it serves as a noise killer, and it acts as a bearing for the sequins resting thereon.

While two carrier discs are disclosed, it is to be understood that even one carrier disc with its light reflecting colored discs will produce satisfactory results and of course, more than two carrier discs with colored light reflecting discs thereon may be used.

For some purposes a complete speaker mechanism, including cone, may be used, and anything that will vibrate the reflecting mechanism may be used, audio as well as electrical.

The invention may, of course, be of various sizes and it has a great many uses such as an enterainment device, an advertising display device, a light show for a rock and roll band, a theater intermission display, illuminating means for Christmas trees. Another use is as a teaching aid for teaching deaf children music and/or rhythm.

The invention and its attendant advantages will be understood from the foregoing description and it will be apparent that various changes may be made in the form, construction and arrangement of the parts of the invention without departing from the spirit and scope thereof or sacrificing its material advantages, the arrangement hereinbefore described being merely by way of example, and I do not wish to be restricted to the specific form shown or uses mentioned except as defined in the accompanying claims.

I claim:

1. A transducer apparatus, comprising:
   (A) light reflecting and mixing mechanism including:
      (a) a carrier disc having an axial opening therethrough,
      (b) a carrier disc support means including a stage,
      (c) a carrier disc axle pin extending through the opening in the carrier disc and secured to said stage,
      (d) at least one light reflecting and mixing disc axle pin secured to said carrier disc,
      (e) a light reflecting and mixing disc loosely mounted on the axle pin secured to the carrier disc, and
   (B) vibrator means for vibrating the light reflecting and mixing mechanism.

2. The invention defined by claim 1, wherein there is a coupler having an opening therethrough mounted on the carrier disc axle pin between the stage and the carrier disc, the carrier disc axle pin being received in the opening in said coupler and said carrier disc resting on said coupler.

3. The invention defined by claim 2, wherein the vibrator means for vibrating the light reflecting and mixing mechanism is an electrical device.

4. The invention defined by claim 2, wherein the carrier disc has a dull, light absorbing surface, and there are a plurality of light reflecting and mixing disc axle pins with light reflecting and mixing discs operably mounted thereon, said light reflecting and mixing discs being variously colored, said reflecting discs having axial openings therein for reception of respective axle pins, said openings in the reflecting discs being of sufficiently larger diameter than the diameter of their axle pins so that said reflecting discs, when the light reflecting and mixing mechanism is vibrated, will rapidly vibrate, rotate, rock and shift on their respective axle pins.

5. The invention defined by claim 4, wherein there is dark flock cemented to the upper surface of the carrier disc and the colored light reflecting discs rest on the flocked surface.

6. The invention defined by claim 4 including light producing means for directing light onto the colored light reflecting and mixing discs; and a screen for receiving light reflected by said light reflecting and mixing discs.

7. The invention defined by claim 6, wherein the vibrator means is a speaker driving motor having a voice coil; and there is a radio having a speaker; and means for connecting the speaker driving motor in parallel with respect to said radio speaker.

8. The invention defined by claim 4, including a second carrier disc of smaller diameter than the first mentioned carrier disc and having a dull upper surface, said second carrier disc having an axial opening therethrough operably mounted on said first mentioned axle pin; a second coupler of harder material than the first mentioned coupler, said second coupler having an opening therethrough mounted on said first mentioned axle pin with the latter extending through said opening in the last mentioned coupler; axle pins secured to the smaller carrier disc; and light reflecting and mixing discs for the second carrier disc; each of the light reflecting discs on both carrier discs being dished and faceted; the light reflecting disc for said second carrier disc having an axial hole therein, said light reflecting discs being mounted on the axle pins on the smaller carrier disc, the holes in said light reflecting discs being of larger diameter than the diameter of their respective axle pins.

9. The invention defined by claim 2, wherein the axle pin receiving holes of the couplers and of all of the discs are of larger diameter than the diameter of the respective axle pins and the parts of the light-reflecting and mixing mechanism are of low mass and of relatively light weight and said parts are in balance.

10. The invention defined by claim 1, wherein the coupler is of a relatively soft, vibration and noise absorbing material.

11. The invention defined by claim 4, including light producing means for directing light onto the colored light reflecting and mixing discs; and an optical system for

receiving light reflected by said light reflecting and mixing discs.

12. The invention defined by claim 1, including a second carrier disc smaller than the first mentioned carrier disc and having an opening therethrough for operable disposition on the carrier disc axle pin; at least one light reflecting and mixing disc axle pin secured to the second carrier disc; a light reflecting and mixing disc loosely mounted on the axle pin secured to the second carrier disc; and means for effecting frequency discrimination between discs.

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U.S. Cl. X.R.

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