

[54] **SINGLE ACTUATOR FOR EFFECTING MULTIPLE CONTROLS**

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[58] Field of Search **179/1 G, 1 VL; 338/128, 129, 133; 200/1 R, 5 R, 4, 6 A**

[56] **References Cited**

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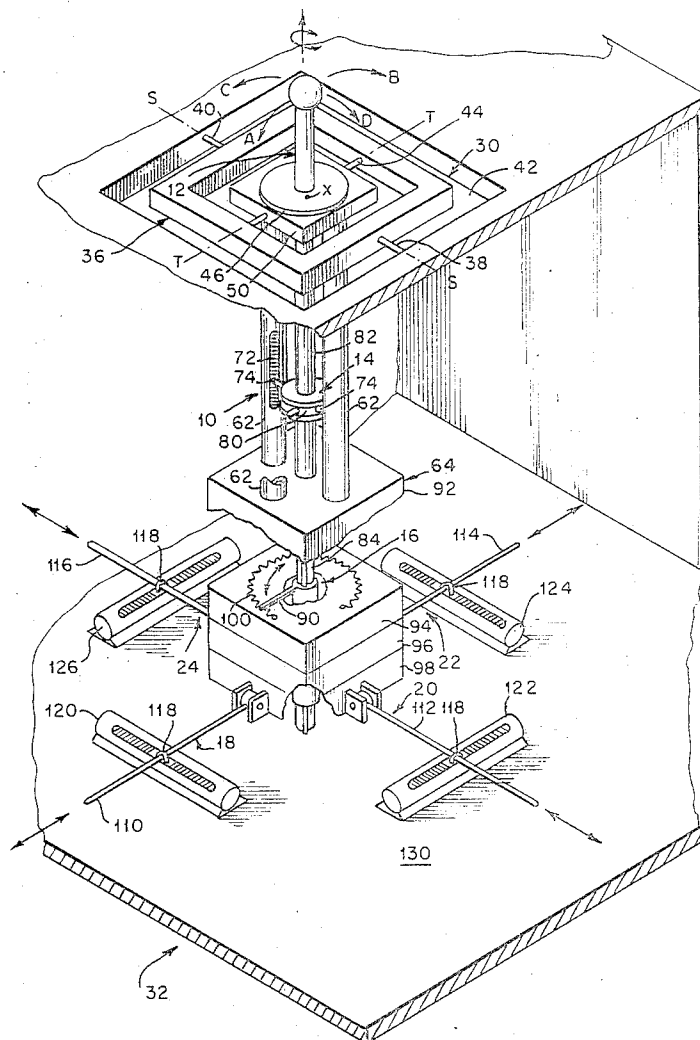
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[57] **ABSTRACT**

A control actuator in a first mode of displacement is shifted longitudinally along a predetermined axis to effect a first form of control to blend the sound for a stereo high fidelity sound system. In a second mode of displacement the actuator is rotated about the predetermined axis to effect a second form of control to vary the volume or loudness level of the stereo high fidelity sound system. In a third mode of displacement the actuator is either shifted to a position wherein it is inclined with respect to the predetermined axis, or as that its axis is shifted so as to be parallel with the predetermined axis, to effect a third form of control to arrange the stereo image or balance presented by the high fidelity sound system. The actuator is further more displaceable in a multiple mode including any two or even all three of the aforementioned modes to simultaneously effect the forms of control.

12 Claims, 4 Drawing Figures



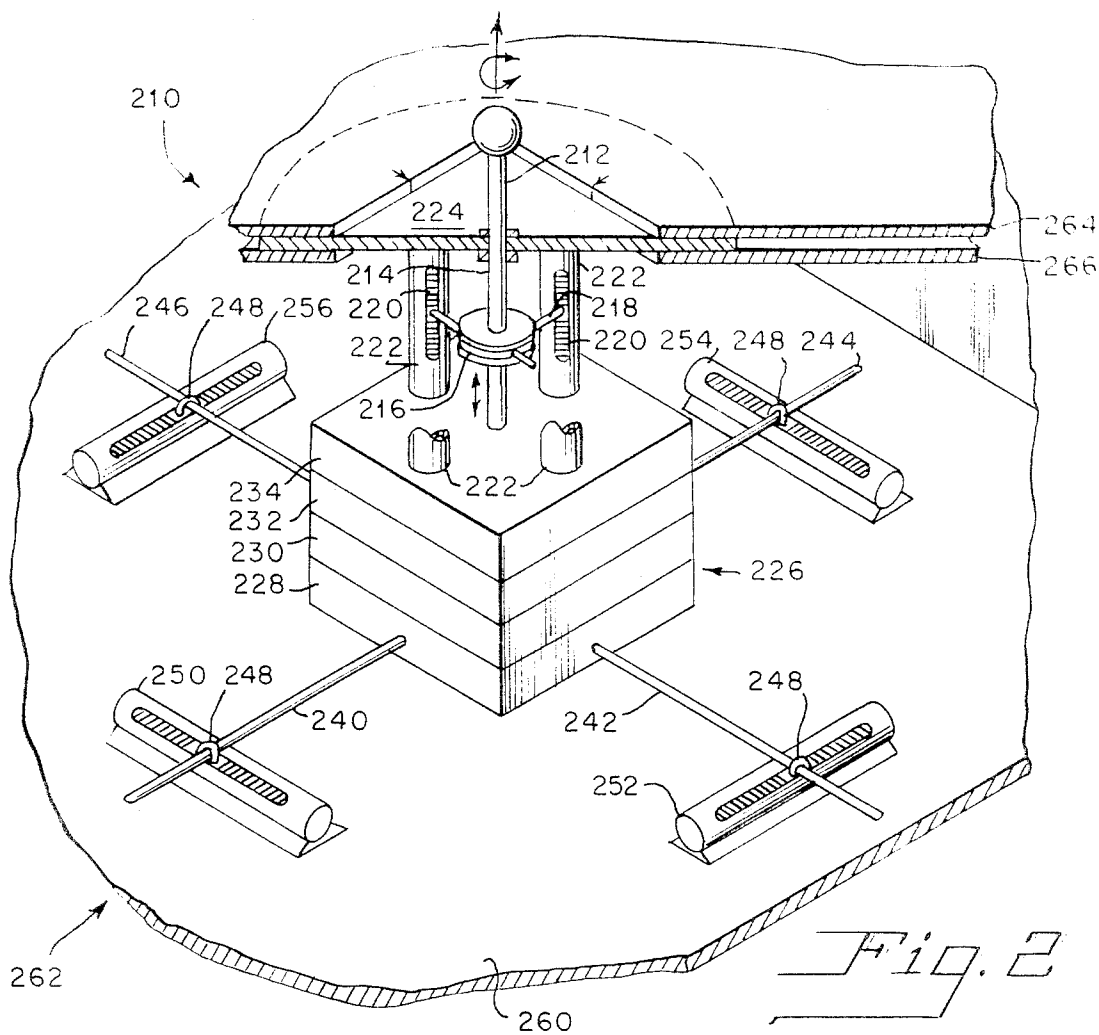


Fig. 2

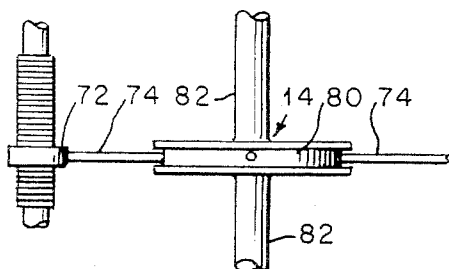
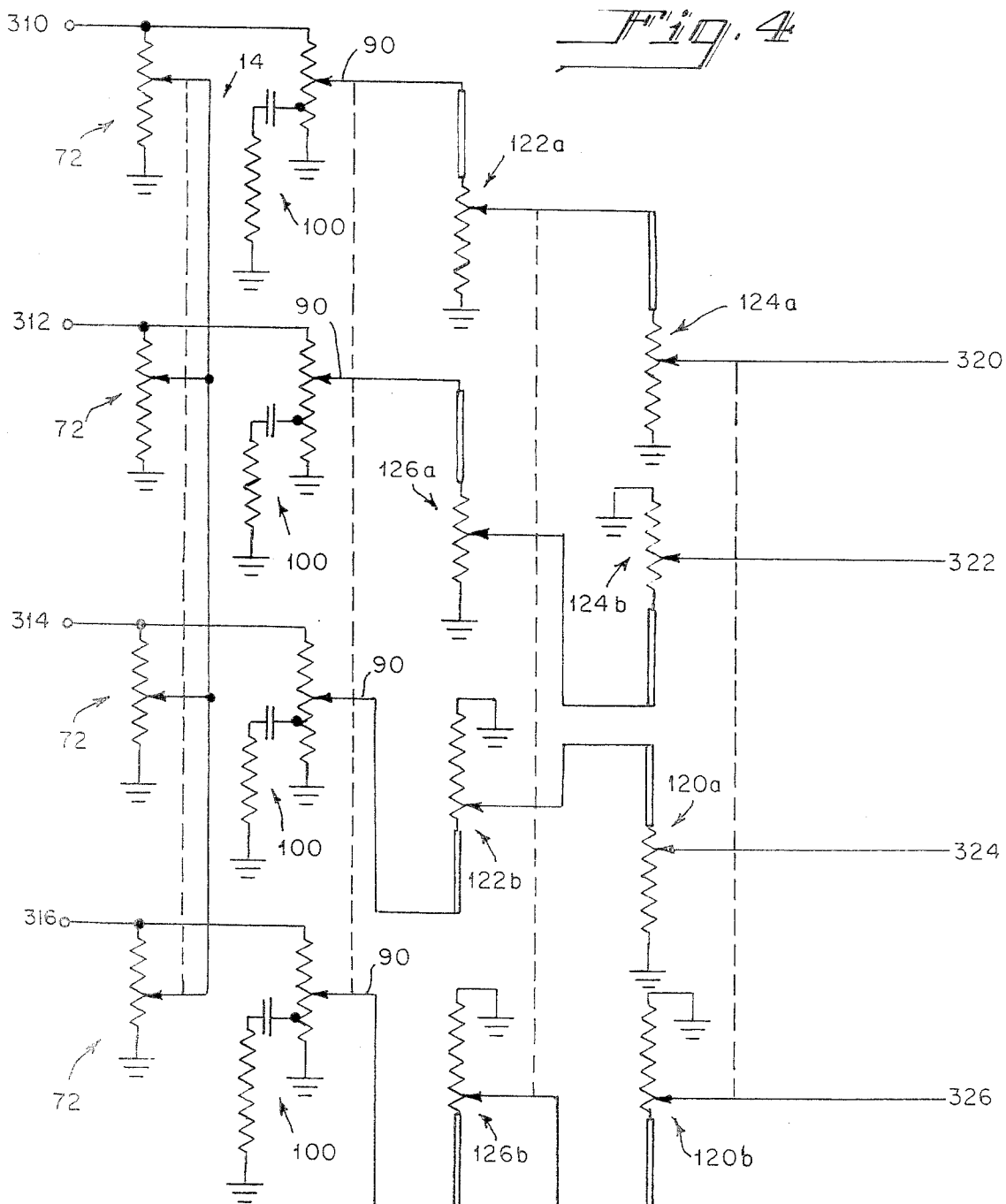


Fig. 3

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SINGLE ACTUATOR FOR EFFECTING MULTIPLE CONTROLS

BACKGROUND OF THE INVENTION

This invention relates to control actuators and more particularly to single actuators displaceable in plural modes to effect plural forms of control, and in multiple mode, including two or more of said plural modes, to effect plural forms of control simultaneously.

DESCRIPTION OF PRIOR ART

It is quite common in controlling many mechanisms and systems and most especially in controlling stereo high fidelity sound systems, to require multiple controls in order to properly operate the system. Most frequently a plurality of the controls must be varied to attain a desired level of performance.

A large number of existing mechanisms and systems utilize a single control actuator for each element of the mechanism or system to be controlled. As such, the controls are usually quite complex and costly, and often take considerable time to adjust in order to attain a desired level of performance from the mechanism or system. Adjustment of one control proportionate to another is almost impossible.

In those mechanisms wherein plural controls are operated by a single actuator, such as shown in U.S. Pat. Nos. 1,909,370 and 2,042,990, the structures are quite inefficient and complex in operation and the number of elements being controlled is significantly limited because the available modes of operation for the actuators are quite restricted.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide an improved control actuator.

It is a further object to provide an improved control actuator displaceable in plural modes to effect plural controls.

A still further object is to provide an improved control actuator which may be operated in any one of a plurality of individual modes to effect individual types of control and which may also be operated in a multiplicity of said modes at one time to effect a multiplicity of controls simultaneously.

Another object is to provide an improved control actuator for a stereo high fidelity sound system.

Still another object is to provide an improved control actuator for operating the multiple controls on a multiple speaker stereo high fidelity sound system.

Yet still another object is to provide an improved control actuator operable in any one of plural modes to effect any of plural types of control over a multiple speaker stereo high fidelity sound system, and which is furthermore operable in plural modes simultaneously, to simultaneously effect plural controls.

This invention involves a control actuator and templates providing same in the form of a single mechanism operable in a first mode to effect only a first type of control, in a second mode to effect only a second type of control, in a third mode to effect only a third type of control, and in a multiple mode including two or more of said first, second or third modes to simultaneously effect said first, second and/or third types of control.

Other objects, features, and advantages of the invention in its details of construction and arrangement of

parts, will be seen from the above, from the following description of the preferred embodiment when considered in conjunction with the drawings, and from the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a perspective view of a control actuator incorporating the instant invention and showing same operating a plurality of controls for the speaker system of a multiple speaker stereo high fidelity sound system;

FIG. 2 is a perspective view of a modified form of control actuator incorporating the instant invention and showing same operating a plurality of controls for the speaker system of a multiple speaker stereo high fidelity sound system;

FIG. 3 is a detail view of a portion of the control actuators of FIGS. 1 and 2; and

FIG. 4 is a schematic electrical diagram for that portion of the multiple speaker stereo high fidelity sound system controlled by the control actuator of FIGS. 1 and 2.

DESCRIPTION OF PREFERRED EMBODIMENT

For convenience, the invention will be described as applied to a multiple speaker stereo high fidelity sound system. A control actuator, of "joy stick" type construction, is provided to control the sound blend, volume, and the stereo image or balance of the system. The actuator is slid along a predetermined axis to control the sound blend by varying the setting of a plurality of potentiometers. It is rotated about said predetermined axis to control the volume by varying the setting of another plurality of potentiometers. It is displaced in any one of many direction with respect to said predetermined axis to control the balance by varying the setting of still another plurality of potentiometers. The actuator may be operated in any one of the above modes at a time or it may be operated in any combination of the above modes at once. It being understood, nevertheless; that the specific mode of operation described need not necessarily operate the specific type of control associated therewith but that any of the types of controls can be operated by any mode of operation; that other types of controls may be operated during one of the modes of operation of the actuator and that many forms of equipment, other than high fidelity sound systems, but having multiple controls, may be controlled by the actuator.

With reference to FIG. 1 there is generally shown at 10 a control actuator including a joy stick or operator 12, a first control setter 14, a second control setter 16 and third control setters 18, 20, 22 and 24. A gimbal type mounting 30 positions actuator 10 in a housing 32 so as to permit pivotal movement of actuator 10 about a pivot point X.

Gimbal type mounting 30 includes a frame 36 disposed for rocking movement about an axis of rotation S passing through pins 38 and 40 extending between frame 36 and the opposed sides of an aperture 42 formed in the top of housing 32. Pins 38 and 40 may be fixedly carried by housing 32 with frame 36 rotatably disposed thereon, or they may be fixedly carried by frame 36 and rotatably disposed in housing 32.

Another pair of pins 44 and 46 extend inwardly from opposed inner walls of frame 36 to mount therewithin a plate member 50 for rocking movement about an axis

of rotation T passing through pins 44 and 46. Pins 44 and 46 may be fixedly carried by frame 36 with plate 50 rotatably disposed thereon, or they may be fixedly carried by plate 50 and rotatably disposed in frame 36.

Four posts 62 (one not shown) extend down from plate 50 and interconnect same to a control box 64. Each post 62 is hollow and houses a variable potentiometer 72 of conventional configuration. A control pin 74 (FIGS. 1 and 3) extends outwardly from the wiper arm of each potentiometer 72 to ride in a groove 80 formed in first control setter 14. Suitable circuitry interconnect potentiometers 72 into the stereo high fidelity sound system to control the sound blending thereof.

First control setter 14 is carried by a control rod 82 which extends up from control setter 14 to pass through plate 50 and terminate in joy stick or operator 12. Control rod 82 extends down from control setter 14 to terminate in an externally splined portion 84 disposed within internally splined second control setter 16. The disposition of control rod 82 within plate 50 is such as to permit rotation of rod 82 with respect to plate 50 and longitudinal movement of control rod 82 with respect to plate 50. Both said rotational movement and said longitudinal movement of rod 80 are with respect to a predetermined axis which, in FIG. 1, passes centrally down rod 82.

Longitudinal displacement of rod 82 results in a corresponding displacement of control setter 14, and through the coaction between control setter 14 and pins 74, a corresponding movement of the wiper arms of potentiometers 72 to vary the settings thereof. All four potentiometers 72 are varied simultaneously. Longitudinal movement of control rod 82, however, has no effect on second control setter 16 because splined portion 84 of rod 82 will merely move with respect to control setter 16.

Rotational movement of control rod 82 will, however, through the splined connection at 84, result in a rotation of control setter 16 and a corresponding movement of four wiper arms 90 (only one shown) carried by control setter 16. A wiper arm 90 is disposed in each of sections 92 and 94, 96 and 98 of control box 64. Each wiper arm 90 is disposed for coaction with a variable potentiometer 100 of conventional configuration and suitably interconnected into the circuitry of the stereo high fidelity sound system to control the volume or loudness level thereof. All four potentiometers 100 are varied simultaneously. Rotational movement of control rod 82 will not however affect potentiometers 72, because pins 74 thereof will merely ride in groove 80 of first control setter 14.

Third control setters 18, 20, 22 and 24 are pivotally disposed proximate the bottom of control box 64 and include setting rods 110, 112, 114 and 116 respectively. Setting rods 110, 112, 114, and 116 each extend outwardly from control box 64 to pass through an aperture suitably formed in the movable wiper arms 118 of variable potentiometers 120, 122, 124, and 126 respectively. Potentiometers 120, 122, 124 and 126 are fixedly disposed in a simulated square on the bottom wall 130 of housing 32 and are suitably connected into the circuitry of the stereo high fidelity sound system to control the speaker balance thereof.

When joy stick 12 is rocked about axis of rotation S, either in the direction of arrow A or the direction of arrow B, frame 36 is also so rocked due to its connection to plate 50 through pins 44 and 46, and control rod

82 assumes an inclined position with respect to point X.

Control box 64 is also moved carrying with it setting rods 110, 112, 114 and 116. Rods 110 and 114 will, however, merely pass through the aperture in their associated wiper arms 118 without affecting the setting of potentiometers 120 and 124; while rods 112 and 116 will act upon the associated wiper arms 118 to vary the settings of potentiometers 122 and 126.

Movement of joy stick 12 about axis of rotation T either in the direction of arrow C or the direction of arrow D, results in a corresponding movement of control rod 82 to an inclined position with respect to point X. Frame 36 does not however move due to the rocking interconnection between plate 50 and frame 36 through pins 44 and 46. Control box 64 is moved accordingly carrying with it setting rods 110, 112, 114, and 116. Rods 112 and 116 will, however, merely pass through the apertures in their associated wiper arms 118 without affecting the settings of potentiometers 122 and 128; while rods 110 and 114 will act upon their associated wiper arms 118 to vary the settings of potentiometers 120 and 124.

Gimbal type mounting 30 is of a type which permits movement of joy stick 12 about point X in directions other than A, B, C and D. As such control rod 82 and control box 64 will effect a corresponding movement of setting rods 120, 122, 124 and 126. There will be some slippage of rods 120, 122, 124 and 126 with respect to their associated wiper arms 118, and some coaction thereof with wiper arms 118 to move same and vary the settings of all four potentiometers 120, 122, 124 and 126.

It should be readily seen that joy stick 12 may be displaced in its rotational mode, its longitudinal shifting mode, or its inclined shifting mode separately to separately exercise control of the system through the appropriate potentiometers; and that any two and even all three of said displacement modes may be accomplished simultaneously to simultaneously exercise control of the system through the appropriate potentiometers.

In FIG. 2 there is shown a control actuator 210 including a joy stick 212 having a control rod 214 mounting, a first control setter formed with a groove 216 within which is received pins 218 of four potentiometers 220 (only two shown) in the same manner as the corresponding control area for FIG. 1. Potentiometers 220 are carried in the hollow of four posts 222 which interconnect a plate 224, through which control rod 214 passes, to a control box 226.

Control box 226 includes four sections 228, 230, 232 and 234 each enclosing a potentiometer with a rotary wiper arm mounted to control rod 214 through a splined connection similar to that shown at 84 in FIG. 1.

Four setting rods 240, 242, 244 and 246 extend outwardly from control box 226 to pass through apertures suitably formed in movable wiper arms 248 of variable potentiometers 250, 252, 254 and 256 respectively. Potentiometers 250, 252, 254 and 256 are fixedly secured to a bottom wall 260 of a housing 262. Housing 262 includes having an upper wall formed from a pair of spaced plates 264, and 266 between which plate 224 is disposed in such a manner as to permit longitudinal displacement of plate 224 in directions perpendicular to control rod 214.

All potentiometers are suitably interconnected into the circuitry of the stereo high fidelity system so as to

effect control thereover in a manner similar to that exercised by the potentiometers of the embodiment of FIG. 1. Thus rotation of joy stick 212 about its axis varies the settings of the potentiometers within sections 228, 230, 232 and 234 of control box 226. Up and down movement of joy stick 212 varies the setting of potentiometers 220. Movement of joy stick 212 in such a way as to slide plate 224 with respect to plates 264 and 266 displaces the axis of joy stick 212 to any one of many possible parallel positions and results in a corresponding movement of control box 226 and setting rods 240, 242, 244 and 246 extending therefrom. This action varies the settings of potentiometers 250, 252, 254 and 256 accordingly.

In FIG. 4 a schematic diagram is presented of that portion of the circuitry controlled by control actuator 10 of FIG. 1. The circuit would be the same for control actuator 210 of FIG. 2.

Four input channels 310, 312, 314, and 316 respectively are connected in circuit with variable potentiometers 72 the wiper arms of which are simultaneously displaced through pins 74 and first control setter 14 as hereinbefore described. Also connected in circuit therewith are the four rotary potentiometers 100 whose wiper arms 90 are rotated due to the action of second control setter 16 as hereinbefore described.

The circuit furthermore includes the four potentiometers 120, 122, 124 and 126 which are each double potentiometers with two movable wipers for each potentiometer. Each potentiometer 120, 122, 124 and 126 includes an *a* section and a *b* section disposed and interconnected as in FIG. 4 so that when one wiper moves across the variable resistor portion of the *a* section its other wiper is in a shunting portion of the *b* section and visa versa.

A plurality of output terminals 320, 322, 324 and 326 are also included in the circuit.

The circuit of FIG. 4 interconnect the various elements hereinbefore described to blend the sound received over input channels 310, 312, 314, and 316; to control the volume thereof; and to control the balance of the signal presented at output channels 320, 322, 324 and 326.

Such control is in response to rotation and/or longitudinal displacement and/or shifting displacement of actuator joy stick as hereinbefore described.

From the above description it will thus be seen that a novel and improved control actuator has been provided; which control actuator is capable of plural modes of operation, is capable of effecting plural controls in each of said plural modes of operation, and is furthermore capable of operation in either one or more than one of said modes at one time to effect either one or more than one type of control at one time.

It is further understood that although I have shown preferred forms of my invention that various modifications may be made in the details thereof without departing from the spirit as comprehended by the following claims.

I claim:

1. A control actuator comprising:

- a. an operating member;
- b. suspension means mounting said operating member:

- 1. for longitudinal sliding movement along a predetermined axis passing through said operating member;

- 2. for rotational movement about said predetermined axis; and
- 3. for displacement with respect to said predetermined axis;

c. first control setting means carried by said operating member operative only during sliding movement thereof;

d. second control setting means carried by said operating member operative only during rotational movement thereof;

e. third control setting means carried by said operating member operative only during displacement thereof with respect to said predetermined axis;

f. said operating member being capable of longitudinal sliding movement, rotational movement, and displacement with respect to said predetermined axis at the same time.

2. The control actuator of claim 1 wherein said suspension means includes a gimbal type mounting for said operating member by which said displacement with respect to said predetermined axis places said operating member in an inclined position and so as to pass through a point on said predetermined axis.

3. The control actuator of claim 1 wherein said suspension means includes a control plate substantially freely moveable between two spaced plates disposed proximate upper and lower surfaces of said control plate by which said displacement with respect to said predetermined axis places said operating member in positions where it is parallel but spaced from said original position of said predetermined axis.

4. The control actuator of claim 1 wherein there is provided a plurality of electrical control means coacting with said operating member to be operated thereby during movement and displacement thereof.

5. The control actuator of claim 4 wherein:

a. a first one of said electrical control means is operated by said operating member during said rotational movement thereof;

b. a second one of said electrical control means is operated by said operating member during said longitudinal sliding movement thereof; and

c. a third one of said electrical control means is operated by said operating member during said displacement thereof.

6. The control actuator of claim 5 wherein said electrical control means includes variable potentiometer means interconnected in a circuit to control multiple speakers in a stereo high fidelity sound system.

7. A control actuator comprising:

a. a plurality of control means each effective to attain a predetermined objective;

b. operating means having a plurality of modes of operation;

c. said operating means being operable during a first predetermined mode of operation to coact with a first predetermined one of said control means to operate same;

d. said operating means being operable during a second predetermined mode of operation to coact with a second predetermined one of said control means to operate same;

e. said operating means being operable during a third predetermined mode of operation to coact with a third predetermined one of said control means to operate same;

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f. said operating means is adapted to slide longitudinally along a predetermined axis when displaced during said first mode of operation;

g. said operating means is adapted to rotate about said predetermined axis when displaced during said second mode of operation; and

h. said operating means adapted for angular movement in at least two transverse directions with respect to said predetermined axis, when displaced during the third mode of operation.

8. The control actuator of claim 7 wherein: said operating means is stick like and is mounted and constructed so as to be displaceable in said first, second, and third predetermined manners.

9. The control actuators of claims 7, wherein said plurality of control means include a plurality of variable potentiometer means electrically interconnected to control sound, volume and stereo image or balance in a multiple speaker high fidelity sound system.

10. A control actuator comprising:

a. a plurality of control means each effective to attain a predetermined objective;

b. operating means having a plurality of modes of operation;

c. said operating means being operable during a first predetermined mode of operation to coact with a first predetermined one of said control means to operate same;

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d. said operating means being operable during a second predetermined mode of operation to coact with a second predetermined one of said control means to operate same;

e. said operating means being operable during a third predetermined mode of operation to coact with a third predetermined one of said control means to operate same;

f. said operating means is adapted to slide longitudinally along a predetermined axis when displaced during said first mode of operation;

g. said operating means is adapted to rotate about said predetermined axis when displaced during said second mode of operation; and

h. said operating means is adapted to be disposed in any one of a plurality of positions parallel to said predetermined axis when displaced in a third predetermined manner.

11. The control actuator of claim 10 wherein: said operating means is stick like and is mounted and constructed so as to be displaceable in said first, second, and third predetermined manners.

12. The control actuators of claim 10, wherein said plurality of control means include a plurality of variable potentiometer means electrically interconnected to control sound, volume and stereo image or balance in a multiple speaker high fidelity sound system.

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