United States Patent

Bosche, Jr.

[15] **3,701,833**

[45] **Oct. 31, 1972**

[54] **SWELL SHADE CONTROL**

[72] Inventor: **Walwin J. Bosche, Jr.**, Highland, Ill.

[73] Assignee: **The Wicks Organ Company**, Highland, Ill.

[22] Filed: **Nov. 16, 1971**

[21] Appl. No.: **199,205**

[52] **U.S. Cl.**.....**84/346**, 84/372

[51] **Int. Cl.**.....**G10b 3/16**

[58] **Field of Search**.....84/346, 347, 372

[56] **References Cited**

UNITED STATES PATENTS

1,693,752	12/1928	Hammond	84/347
1,814,472	7/1931	Hammond	84/346
3,613,505	10/1971	Bubula	235/201 X

Primary Examiner—Richard B. Wilkinson
Assistant Examiner—Lawrence R. Franklin
Attorney—Rogers, Ezell, Eilers & Robbins

[57] **ABSTRACT**

This invention relates to a swell shade control for use with pipe organs and comprises an actuator means and means for connecting the actuator means to the swell shades such that operation of the actuator means in one direction opens the shades, and operations of the actuator means in the opposite direction closes the shades. A command means transmits a first set of electrical signals to an electrical network, which signals represent a final swell shade position. Means responsive to the position of the swell shades are also provided for transmitting second sets of signals to the electrical network representing the instantaneous positions of the shades. The electrical network includes means for generating control signals depending on how the first and second sets of signals compare, which control signals are used to operate the actuator means in a direction to move the swell shades toward the final position.

14 Claims, 11 Drawing Figures

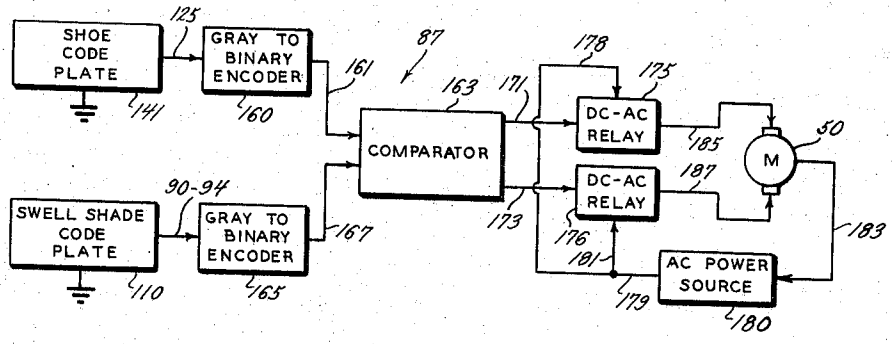


FIG. 2.

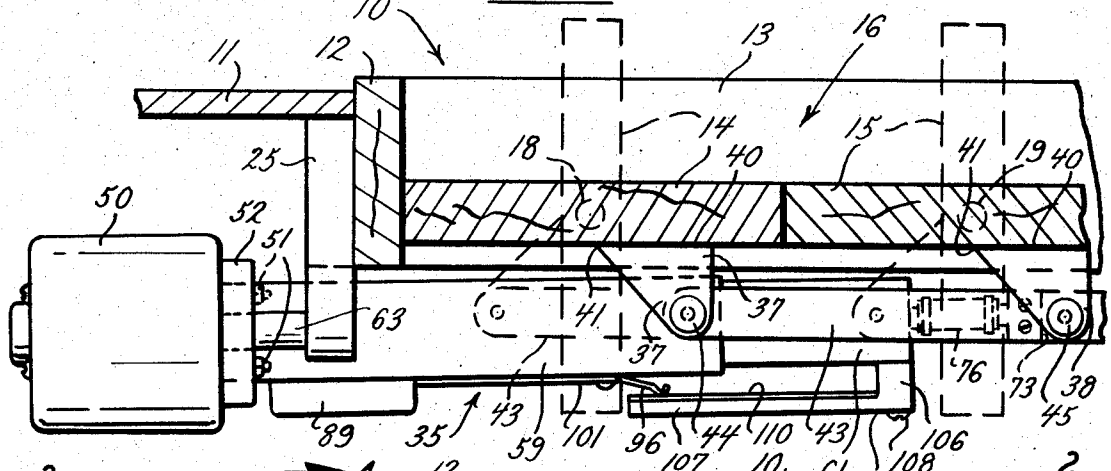
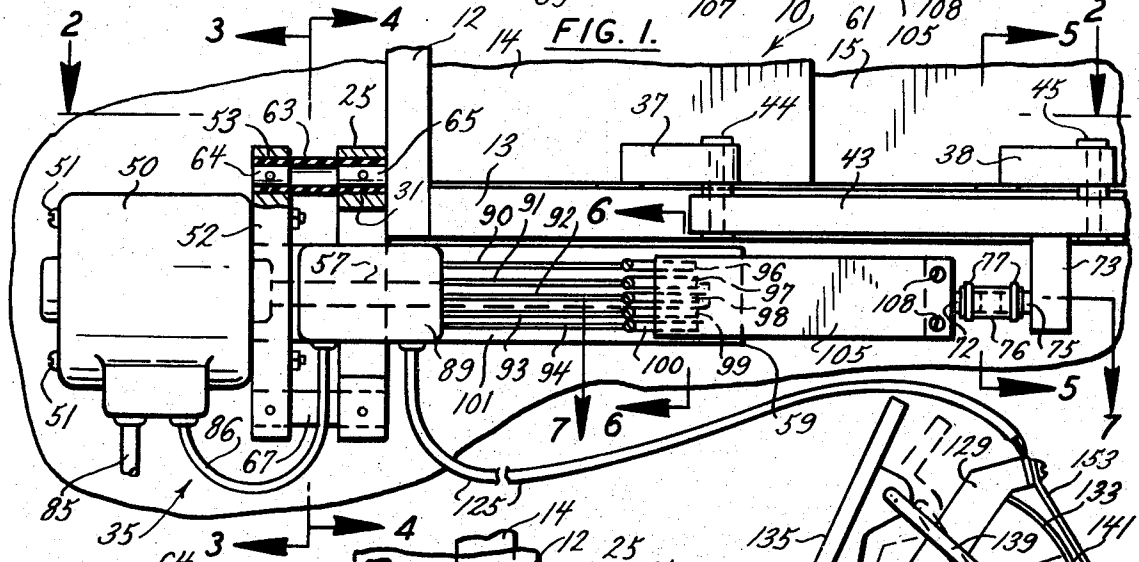


FIG. 1.



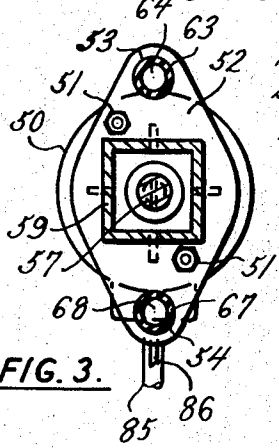


FIG. 3.

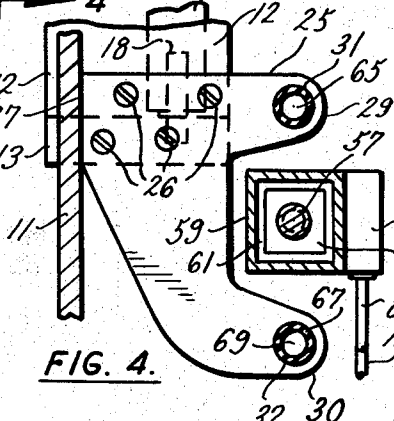
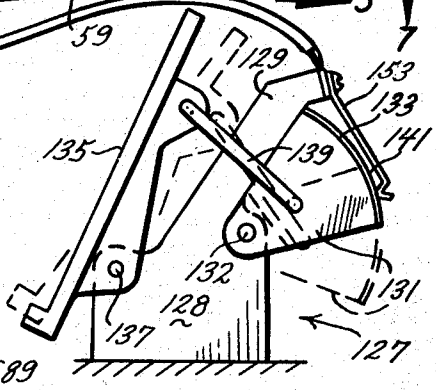


FIG. 4.



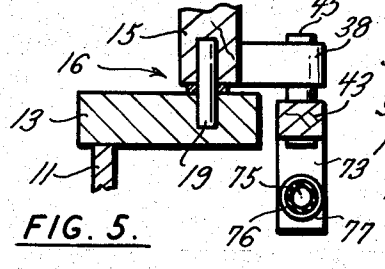


FIG. 5.

FIG. 6.

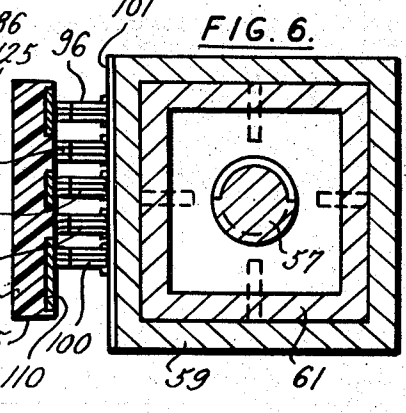


FIG. 7.
FIG. 8.
FIG. 9.
FIG. 10.
FIG. 11.
SHOE CODE PLATE
GRAY TO BINARY ENCODER
COMPARATOR
GRAY TO BINARY ENCODER
SWELL SHADE CODE PLATE
DC-AC RELAY
DC-AC RELAY
AC POWER SOURCE
M

SWELL SHADE CONTROL

SUMMARY OF THE INVENTION

This invention relates to a swell shade control assembly for use with pipe organs and particularly one that is digitally operated to provide smooth, quiet, and accurate control.

It is conventional in the pipe organ art to enclose selected sets of organ pipes in a box usually of wood. This box may be in the form of a compartment built into the wall of the room in which the organ is installed. The front opening of the compartment has swell shades mounted therein, which are similar to venetian blinds only mounted to rotate about a vertical axis between fully closed and fully opened positions. To some degree these shades are used to control the volume and tone of the enclosed pipes and are operated by the organist by means of a foot pedal control located at the organ console. Means, of course, must be provided for producing degrees of opening or closing of the swell shades corresponding to positions of the foot pedal. Such means must operate quietly, smoothly, precisely, and quickly inasmuch as the organist wants the control to react instantly to his command and yet without detracting from the quality of his music. It is further desirable that such a control be relatively small and easy to install. The swell shade control of this invention is such a device.

The control of this invention includes an actuating means suitably mounted to the swell shade enclosure. A linkage arrangement connects the actuating means to the swell shades whereby actuation of the actuating means in one direction causes the swell shades to open and actuation of the actuating means in the other direction causes the swell shades to close. A first code plate is mounted to the actuating means, the code plate being digitally coded. A plurality of detectors are also mounted in relation to the code plate to continually detect code readings from the code plate depending upon its position with respect thereto. The detectors are electrically connected to a digital network.

Also electrically connected to the digital network is another set of detectors which engage a second code plate. The second code plate is mounted on a foot pedal assembly so as to move in relationship to the second set of detectors in response to movement of a foot pedal. Hence, for any position of the foot pedal, and position of the actuating means which operates the swell shades, signals are sent to the digital network corresponding to a first digital code reading from the first set of detectors and a second digital code reading from the second set of detectors.

The digital network includes a comparator means for comparing these two sets of input signals and for generating one output signal when the first detected signal is greater than the second, and another output signal when the second detected signal is greater than the first. These output signals from the comparator means are used to actuate the actuating means to open or close the swell shades as indicated by the comparator outputs. As the swell shades open or close as indicated, the first code plate moves in relationship to the first set of detectors until they detect the same reading as the second set. When this occurs, the output of the comparator means becomes zero and the actuating means ceases operation.

Because the ratio of sound volume to swell shade opening between the fully closed and fully opened positions is generally logarithmic, requiring relatively large variations in swell shade opening near the fully opened condition to get a given change in volume compared to the variation required near the fully closed condition to get the same change in volume, the first code plate is coded on a logarithmic scale. Hence, it is one of the features of this invention that linear actuation of the foot pedal provides logarithmic actuation of the swell shades and a linear change in sound volume.

Several types of actuating means can be used in this invention. In one embodiment the actuating means comprises an electric motor and lead screw, the electric motor being operated in either a clockwise or counterclockwise direction as directed by the output signals from the comparator means. As the lead screw turns in one direction it moves a sliding member so as to open the swell shades, and as the lead screw turns in the opposite direction, it moves the sliding member so as to close the swell shades.

In another embodiment of the invention the actuating means comprises a bellows having air intake and exhaust lines controlled by intake and exhaust valves. These valves in turn are controlled by electric solenoids operated by the comparator output signals. Means are provided for opening and closing the swell shades in response to operation of the bellows. One output signal from the comparator actuates the intake solenoid and valve to inflate the bellows while the other comparator output signal operates the exhaust solenoid and valve to deflate the bellows to thereby open or close the shades.

It is also possible to use other types of actuating means to operate the swell shades in response to the comparator output signals including, for example, air or hydraulic cylinders.

Hence, it is a primary object of this invention to provide a novel swell shade control that has excellent response to the organist's command with excellent reliability.

It is another object of this invention to provide such a control that is relatively small and easy to install.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front elevational view of the swell shade control assembly of this invention shown mounted to a swell shade;

FIG. **2** is a plan view of the swell shade control assembly of FIG. **1**;

FIG. **3** is a view in section taken along the line **3—3** of FIG. **1**;

FIG. **4** is a view in section taken along the line **4—4** of FIG. **1**;

FIG. **5** is a view in section taken along the line **5—5** of FIG. **1**;

FIG. **6** is an enlarged view in section taken along the line **6—6** of FIG. **1**;

FIG. **7** is an enlarged view in section taken along the line **7—7** of FIG. **1**;

FIG. **8** is a plan view of the shoe code plate of this invention;

FIG. **9** is a plan view of the swell shade actuator code plate of this invention;

FIG. 10 is a schematic diagram of the control network of this invention for controlling the operation of the swell shade; and

FIG. 11 is a schematic diagram showing another embodiment of the swell shade control of this invention.

A DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring primarily to FIGS. 1 and 2 there is shown a swell shade enclosure 10 mounted as is conventional in the art in a wall 11 of a room in which it is installed. The swell shade enclosure 10 includes suitable walls such as a side wall 12 and a bottom wall 13, and a plurality of swell shades 14 and 15 each pivotally mounted in a frontal opening 16 of the swell shade enclosure 10 about centrally located vertical axes 18 and 19. There can be any number of swell shades such as the shades 14 and 15 depending on the size of the swell shade enclosure 10. However, for the purpose of this description, it suffices to show only two such shades.

A mounting bracket 25 shaped generally as shown in FIG. 4 is mounted to the side wall 12 of the swell shade enclosure 10 by any suitable means such as screws 26. A back edge 27 of the bracket 25 rests against the wall 11. The bracket 25 has a pair of forwardly extending arms 29 and 30 with holes 31 and 32, respectively, to which a swell shade control assembly 35 of this invention is mounted, as will be explained.

Attached to the swell shades 14 and 15 are generally triangular shaped brackets 37 and 38, respectively, each of which has one of its sides 40 suitably connected to the swell shade such that a corner 41 of the bracket is located near the pivotal point 18 or 19 of the swell shade. A connecting rod 43 is pivotally connected to the bracket 37 at a point 44, and to the bracket 38 at a point 45, whereby movement of the rod 43 in the generally lineal direction causes the brackets 37 and 38 to pivot about the points 44 and 45 to the bracket positions shown by dashed lines. This further causes the swell shades 14 and 15 to pivot about the points 18 and 19 to the open positions shown by dashed lines. The rod 43 is sufficiently long to pivotally connect to each of the swell shade brackets, there being as many brackets as there are swell shades.

The control assembly 35 includes a motor 50 connected by any suitable means such as nut and bolt assemblies 51 to a motor mounting bracket 52 shaped generally as shown in FIG. 3. The motor bracket 52 has upper and lower holes 53 and 54 in axial alignment with the holes 31 and 32 of the bracket 25. The shaft of the motor 50 is connected to a lead screw 57. Surrounding the lead screw 57 is a square shaped outer tube 59 having one end secured to the motor mounting bracket 52. A square shaped inner tube 61 of slightly smaller dimensions than the outer tube 59 is telescoped in the other end of the outer tube 59 to move axially with respect thereto.

A flexible hose 63 extends through the hole 53 in the motor mounting bracket 52 and the hole 31 in the mounting bracket 25 and is secured within these holes with pegs 64 and 65, respectively. Similarly, a flexible hose 67 extends into the hole 54 of the motor mounting bracket 52 and the hole 32 of the bracket 25 and is secured therein with similar pegs 68 and 69, respectively. The hoses 63 and 67 provide flexible mounting means between the control assembly 35 and bracket 25 for purposes to be described. The bracket 25 is positioned such that the lead screw 57, outer tube 59, and inner tube 61 extend generally parallel to the connecting rod 43, and parallel to and slightly in front of and beneath the housing 10.

Referring to FIG. 7, a nut 70 is mounted in the end of the inner tube 61 inside the outer tube 59. The nut 70 has internal threads that engage the lead screw 57.

A plug 71 (see FIG. 7) is mounted within the other end of the inner tube 61 and has a shank 72 extending outwardly away from the tube 61. A bracket 73 is suitably connected to the connecting rod 43 to depend vertically therefrom and has a shank 75 extending toward and in axial alignment with the shank 72. A flexible hose 76 is connected between the shanks 72 and 75 such as by clamps 77 to provide a flexible mounting between the control assembly 35 and the bracket 73 for purposes to be described.

The motor 50 receives power through a suitable cable 85. Another cable 86 transmits signals to the motor 50 from a control network 87 shown schematically in FIG. 10, and which will hereinafter be described. The network 87 is contained within a circuit box 89 mounted to the front wall of the outer tube 59 near the motor 50. A series of conductors 90 through 94 connect the network 87 within the box 89 to a series of wiper arms 96 through 100, respectively. The conductors 90 through 94 are preferably mounted to the front wall of the outer tube 57 in the form of a printed circuit board 101.

Referring primarily to FIGS. 1, 2, and 7, an L-shaped bracket 105 having an end wall 106 and a front wall 107 is connected at its end wall 106 to the front wall of the inner tube 61 such as by screws 108. A code plate 110 (see FIG. 9) is mounted to the inside surface of the front wall 107.

The code plate 110 is made of a conductive material such as copper except for the cutout or aperture portions 111. The code plate 110 is coded by the apertures 111 in a sixteen bit gray code on a logarithmic scale as shown by the scale markings 113. The apertures form four horizontal rows having center lines 116, 117, 118, and 119. Another center line 120 marks a ground path. The code plate 110 is mounted to the inner surface of the wall 107 such that as the inner tube 61 moves axially within the outer tube 59, the code plate 110 moves with respect to the wiper arms 96 through 100 along the paths of the center lines 120 and 116 through 119, respectively, with the wiper arms contacting the left side of the code plate 110 as viewed in FIG. 9 when the inner tube 61 is moved farthest to the right as viewed in FIGS. 1, 2, and 7 and the swell shades are closed.

Another cable 125 transmits signals to the network 87 from a swell shade control shoe assembly 127 shown in FIG. 1. The shoe control 127 includes a base 128 having an arm 129 that extends upwardly and rearwardly. A pie-shaped member 131 is pivotally mounted at 132 to the top of the base 128 just behind the arm 129. The pivotal member 131 has a round surface 133. A foot pedal 135 is pivotally attached at 137 near its bottom to the front of the base 128. A rod 139 has one end pivotally connected to the top of the pedal 135 and the other end pivotally connected to the side of the member 131, whereby operation of the pedal between

the solid and dashed line positions of FIG. 1 causes the member 131 to rotate about the pivot 132 between the solid and dashed line positions shown.

A code plate 141 (see FIG. 8) is mounted on the round surface 133 of the member 131. The code plate 141, like the code plate 110, is made of a conductive material such as copper and has apertures 142 defining a sixteen bit gray code. However, unlike the code plate 110, the gray code of the code plate 141 is arranged linearly as shown by the scale markings 144. The apertures 142 are arranged in four rows as shown by the center lines 146 through 149 with an additional center line 150 defining a ground path just as with the code plate 110. The code plate 141 is mounted to the surface 133 with the left end of the code plate as viewed in FIG. 8 farthest from the arm 129. A series of five wiper arms 153 are mounted to the top of the arm 129 and electrically connected to suitable conductors within the cable 125. The wiper arms 153 are arranged to follow the center lines 146 through 150 as the member 131 is pivoted by operation of the pedal 135. It is preferable that the surface 133 of the member 131 and the inside surface of the L-shaped bracket 105 have raised portions which fit into the apertures 111 and 142 of the code plates 141 and 110, respectively, to provide a smooth surface against which the wiper arms ride.

While electrical contacts or wiper arms and electrically conductive code plates have been described in this embodiment, other types of sensors could be used such as photosensitive or magnetic pickup devices for sensing the code readings off the code plates.

In FIG. 10 there is shown a schematic diagram of the digital control network 87 of this invention. A gray code reading detected by the wiper arms 153 in accordance with their positions along the center lines 146 through 150 of the code plate 141, which reading corresponds to one of sixteen possible readings from the code plate 141, is fed through the cable 125 to a gray to binary encoder 160. Output signals from the encoder 160 representing the binary equivalent of the gray code reading from the code plate 141 are fed through conductors 161 to one input of a comparator network 163.

A gray code reading from the swell shade code plate 110, detected by the wiper arms 96 through 100 and corresponding to their relative position along the center lines 116 through 120 of the code plate 110, is fed through the conductors 90 through 94 to another gray to binary encoder 165. Output signals from the encoder 165 representing the binary equivalent of the gray code reading from the swell shade code plate 110 are fed through conductors 167 to another input of the comparator network 163.

The network 163 compares the signals at its inputs and produces a signal at an output conductor 171 if the signals at its input 161 represent a primary code reading greater than the binary code reading represented by the signals at its input 167, and a signal at an output conductor 173 if the signals at its input 167 represent a primary code reading greater than the binary code reading represented by the signals at its input 161. The signal on the output conductor 171 is fed to the input of a solid state DC to AC relay 175, and the signal on the output conductor 173 is fed to the input of another solid state DC to AC relay 176. The relay 175 has another input connected by a conductor 178 and a conductor 179 to one side of an AC power source 180, and the relay 176 has another input connected by a conductor 181 and the conductor 179 to the same side of the AC power source 180. The other side of the power source 180 is connected by a conductor 183 to suitable windings of the motor 50.

When a signal appears at the conductor 171 to operate the relay 175, a signal is fed from the output of the relay 175 through a conductor 185 to a suitable winding of the motor 50 to drive the motor 50 in a direction so as to open the swell shades 14 and 15. When a signal appears at the conductor 173 to operate the relay 176, a signal is fed from the output of the relay 176 through a conductor 187 to a suitable winding of the motor 50 to drive the motor in a direction so as to close the swell shades 14 and 15.

OPERATION

Suppose that as an initial condition the swell shades 14 and 15 are closed so that the inner tube 61 is telescoped all the way out with the wiper arms 96 through 100 contacting the code plate 110 at a location generally adjacent the extreme left-hand marking of the scale 113. Also, in this initial condition the foot pedal 135 is in its uppermost position shown by solid lines in FIG. 1 so that the wiper arms 153 contact the code plate 141 at a location generally adjacent the far left-hand mark of the scale 144. Suppose now that the organist wishes to open the swell shades 14 and 15 a prescribed amount which from his experience corresponds to depressing the foot pedal 135 a prescribed amount. When the foot pedal 135 is depressed, the pivotal member 131 is rotated about the point 132 causing the code plate 141 to move relative to the wiper arms 153. At the final foot pedal position selected by the organist, the wiper arms 153 are located along the center lines 146 through 150 adjacent some mark of the scale 144. This location corresponds to one of 16 gray code readings. Signals corresponding to the selected reading are fed through the conductors 125 to the network 87 in the box 57. Specifically, these signals are fed to the gray to binary encoder 160 which converts these signals to a binary code reading. The output of the encoder 160 is then fed to one input of the comparator 163.

Meanwhile, signals corresponding to the initial condition gray code reading detected by the wiper arms 96 through 100 on the code plate 110 are fed through the conductors 90 through 94 to the network 87, and specifically to the gray to binary encoder 165. The encoder 165 converts the gray code reading to binary code signals, which signals are fed through the conductor 167 to another input of the comparator 163.

Since the signals on the conductor 161 represent a binary number greater than that represented by the signals on the conductor 167, a signal is generated at the output conductor 171 to operate the relay 175 and to cause the motor 50 to drive in a direction to pull the inner tube 61 further into the outer tube 59 by means of the lead screw 57 turning within the threaded nut 70. If the lead screw 57 and nut 70 have right-hand threads, the motor 50 is wired to drive in a counterclockwise direction as viewed in FIG. 3. This in turn pulls the connecting rod 43 to the left through the hose connection 76 and vertical bracket 73, which further causes the

brackets 37 and 38 to pivot clockwise about the points 18 and 19 to thereby open the swell shades 14 and 15. As the inner tube 61 moves to the left, so also does the code plate 110 so that the wiper arms 96 through 100 sense progressively higher code readings from the code plate 110.

The motor 50 continues to drive, and hence the swell shades 14 and 15 continue to open, until the wiper arms 96 through 100 locate with respect to the code plate 110 at a position along the scale 113 corresponding to a gray code reading equal to that detected by the wiper arms 153 of the shoe assembly 127. When this occurs, the numbers represented by the signals at the inputs of the comparator 163 are equal, the signals on both the output conductors 171 and 173 become zero, and the motor 50 stops.

Since as the brackets 37 and 38 pivot about the points 18 and 19 in an arcuate path, the connecting rod 43, the vertical bracket 73, and hence the outer and inner tubes 59 and 61 must be capable of swinging slightly forward of the swell shade enclosure 10 as the swell shades are actuated. The flexible hose mountings 63, 67, and 76 provide sufficient flexibility to allow for this slight forward movement.

If the organist desires now to close the swell shades 14 and 15 some prescribed amount, he simply releases the foot pedal 135 to a position which he knows from experience corresponds to the desired swell shade opening. Now the system operates just in the reverse of that previously described. The pivotal member 131 is caused to pivot counterclockwise as viewed in FIG. 1 about the point 132 such that the wiper arms 153 detect a lower gray code reading. Since the wiper arms 96 through 100 are detecting the higher gray code reading of the previous swell shade position, the signals on the conductor 167 now represent a number greater than the signals on the conductor 161 to produce a signal on the output conductor 173 of the comparator 163. The signal on the conductor 173 operates the relay 176 causing the motor 50 to drive in the opposite direction. This in turn causes the inner tube 61 and the connecting rod 43 to move to the right further closing the swell shades 14 and 15. The motor 50 continues to drive until the gray code reading detected by the wiper arms 96 through 100 on the code plate 110 is equal to the reading detected by the wiper arms 153 of the shoe assembly 127, at which time the numbers represented by the signals at the inputs of the comparator 163 are equal and the motor 50 stops.

In this manner operation of the foot pedal 135 will locate the swell shades 14 and 15 at any one of 16 positions between fully closed and fully opened. It is, of course, within the scope of this invention to increase or decrease the total number of possible positions by increasing or decreasing the code markings of the code plates 141 and 110 and designing the circuit 87 to handle a corresponding number of bits.

One of the features of this invention is the use of the logarithmic scale for the gray code of the code plate 110 and a linear scale for the gray code of the code plate 141. Toward the closed condition of the swell shades, relatively small changes in swell shade opening or closing produce significant changes in sound volume, while toward the open condition of the swell shades, relatively large changes in swell shade opening or closing are required to produce the same change in sound volume. It has been found that the relationship of swell shade opening to sound volume is generally logarithmic. With the code plate 110 coded on a logarithmic scale, as the pedal 135 is moved one increment near its fully closed position, the corresponding change in swell shade opening is relatively small, but as the foot pedal 135 is moved that same increment further toward its fully opened position, the corresponding change in swell shade opening is greater in accordance with the logarithmic scale 113. In this way linear operation of the pedal 135 produces linear changes in sound volume.

In FIG. 11 there is shown another embodiment of this invention. Here the motor 50 and lead screw 57 arrangement is replaced by a sliding shaft 190 which just as with the first-described embodiment would move a code plate, such as the code plate 110, relative to wiper arms, such as the wiper arms 96 through 100, and would also actuate brackets, such as the brackets 37 and 38, and a connecting rod, such as the rod 43, to operate the swell shades 14 and 15 as heretofore described. An L-shaped linkage 192 is pivotally secured at its corner 193 to a stationary mount 194, pivotally connected at its upper end 196 to the shaft 190 through a slot 197, and pivotally connected at its other end 199 to the upper end of a rod 200. The lower end of the rod 200 is pivotally connected at 202 to the top of an air bellows 203 near its open side. The bottom of the bellows 203 is secured to a solid mounting 204. The bottom and top of the bellows are pivotally connected at 206. A weight 208 is mounted on the top of the bellows 203 near its open side to bias the bellows closed.

A suitable source of compressed air (not shown) is connected to a conduit 210 which feeds the air to the input of an intake valve 212. The output of the intake valve 212 is connected by a conduit 214 to the inner chamber of the bellows 203. The inner chamber of the bellows 203 is also connected by a conduit 216 to the input of an exhaust valve 218, the output of which is connected to an exhaust conduit 220. The valves 212 and 218 are operated by electrical solenoids 222 and 223, respectively. The solenoids 222 and 223 would be operated in the same manner as the motor 50, and would therefore replace the motor 50 in the network 87.

Hence, when a signal appears at the output conductor 171 of the comparator 163, the solenoid 223 is energized to open the valve 218, exhausting air from the bellows 203, closing the bellows 203 an amount corresponding to the positions of the wiper arms with respect to the code plates. This in turn moves the shaft 190 to the left to open the swell shades 14 and 15. Conversely, when a signal appears at the output conductor 173 from the comparator 163, the solenoid 222 is energized to open the valve 212, forcing air into the bellows 203, to open the bellows an amount corresponding to the relative positions of the wiper arms with respect to the code plates. Opening the bellows in turn moves the shaft 190 to the right and closes the swell shades 14 and 15.

Just as with the first-described embodiment, the amount of opening or closing of the swell shades is determined by the position of the pedal 135.

Certainly, further variations can be made on these embodiments and still be well within the scope of this invention. For example, instead of the bellows **203** of the embodiment of FIG. **11**, the shaft **190** could be operated by the piston of an air cylinder or a hydraulic cylinder which in turn would be operated by suitable valves, similar to the valves **212** and **218**, and solenoids similar to the solenoids **222** and **223**. The network **87** would operate in each of these variations as heretofore described.

Various changes and modifications may be made in this invention, as will be readily apparent to those skilled in the art. Such changes and modifications are within the scope and teaching of this invention as defined by the claims appended hereto.

What is claimed is:

1. A swell shade control comprising an actuator means, means for connecting the actuator means to the swell shades such that actuation of the actuator means in one direction opens the shades and actuation of the actuator means in the opposite direction closes the shades, an electrical network, a command means, means responsive to the command means for transmitting first signals to the network representing a final swell shade position, means responsive to the position of the swell shades for transmitting second signals to the network representing the instantaneous position of the shades, means associated with the network for generating one control signal when the first and second signals compare in one manner of predetermined correspondence, means associated with the network for generating another control signal when the first and second signals compare in another manner of predetermined correspondence, and means responsive to the control signals for actuating the actuator means in a direction to move the swell shades toward the final position.

2. The swell shade control of claim **1** wherein the first and second signals represent digital code readings.

3. The swell shade control of claim **2** wherein one control signal is generated when the first signals represent a digital code reading greater than the digital code reading represented by the second signals, and the other control signal is generated when the second signals represent a digital code reading greater than the digital code reading represented by the first signals.

4. The swell shade control of claim **1** wherein the command means comprises a swell shoe having a base and a movable pedal, and means for generating the first signals in response to the position of the pedal.

5. The swell shade control of claim **1** further comprising a first code plate associated with the command means having a digital code thereon, first detector means for detecting a selected code reading from the code plate, means responsive to the first detected code reading to generate the first signals, a second code plate associated with the actuator means having a digital code thereon, a second detector means, means for mounting the second detector means and second code plate for detecting a code reading on the second code plate corresponding to the instantaneous position of the shades, and means responsive to the second detected code reading for generating the second signals.

6. The swell shade control of claim **5** wherein the command means comprises a swell shoe having a base and a movable pedal mounted thereto, and further comprising means for mounting the first code plate and first detector means on the swell shoe for detection by the first detector means of code readings on the first code plate corresponding to pedal positions.

7. The swell shade control of claim **5** wherein the code on the first code plate is generally linear and the code on the second code plate is generally logarithmic.

8. The swell shade control of claim **1** wherein the actuating means comprises an electric motor, a lead screw mounted to the shaft of the electric motor, means responsive to rotation of the lead screw in one direction to open the shades, and means responsive to rotation of the lead screw in the opposite direction to close the shades.

9. The swell shade control of claim **8** further comprising a first code plate associated with the command means having a digital code thereon, first detector means for detecting a selected code reading from the code plate, means responsive to the first detected code reading to generate the first signals, a second code plate associated with the actuator means having a digital code thereon, a second detector means, means for mounting the second detector means and second code plate for detecting a code reading on the second code plate corresponding to the instantaneous position of the shades, and means responsive to the second detected code reading for generating the second signals.

10. The swell shade control of claim **9** further comprising a first tube surrounding the lead screw in fixed relation thereto, a second tube mounted for telescoping movement in relation to the first tube, means responsive to rotation of the lead screw in one direction to extend the second tube with respect to the first tube, means responsive to rotation of the lead screw in the opposite direction to retract the second tube with respect to the first tube, means for closing the shades in response to movement of the second tube in one direction, and means for opening the shades in response to movement of the second tube in the reverse direction.

11. The swell shade control of claim **10** wherein the second code plate is mounted to move with movement of the second tube relative to the second detector means.

12. The swell shade control of claim **9** wherein the first and second detector means are electrical contacts, and the surfaces of the first and second code plates are electrically coded along their lengths, and further including means for mounting the contacts of the first detector means to contact the coded surface of the first code plate producing electrical signals at the first contacts representing a digital code reading corresponding to a position along the length of the first code plate, and means for mounting the contacts of the second detector means to contact the coded surface of the second code plate producing electrical signals at the second contacts representing digital code readings corresponding to positions along the lengths of the second code plate.

13. The swell shade control of claim **9** wherein the command means comprises a swell shoe having a base and a movable pedal mounted thereto, and further comprising means for mounting the first code plate and first detector means on the swell shoe for detection by

the first detector means of code readings on the first code plate corresponding to pedal positions.

14. The swell shade control of claim 1 wherein the actuating means includes a bellows, means for applying air to the bellows in response to one control signal, means for exhausting air from the bellows in response to the other control signal, and means to open and close the shades in response to operation of the bellows.

* * * * *