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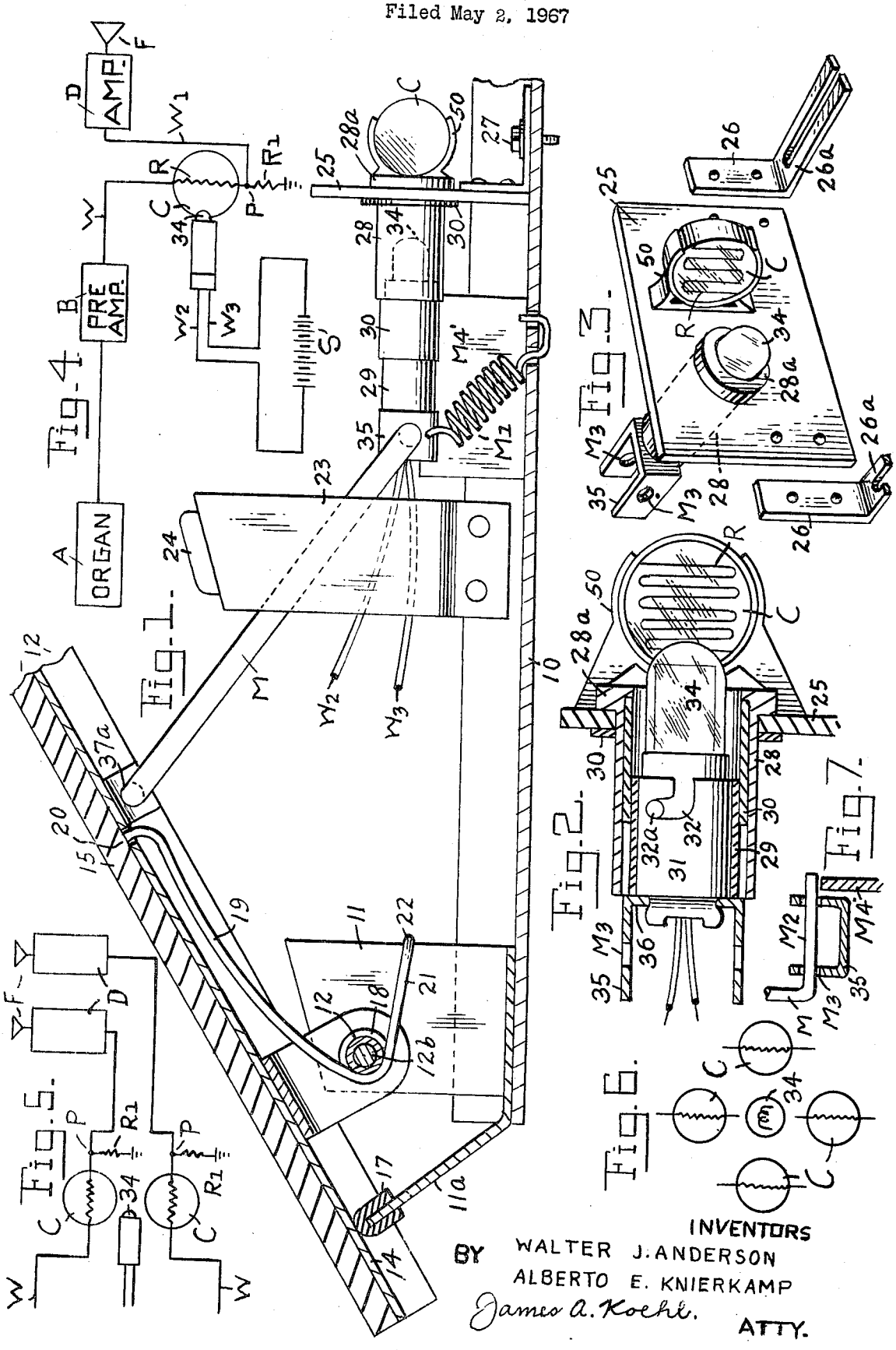

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PHOTORESISTOR SWELL CONTROL FOR A MUSICAL INSTRUMENT

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ABSTRACT OF THE DISCLOSURE

A swell control for an electrical musical instrument embodies a photoresistor coupling the tone signal output to the signal reproducing means of the instrument. An incandescent light bulb is energized by direct current of low voltage to emit light the luminous intensity of which is insufficient per se to excite the photoresistor. The bulb is selectively movable in a housing and disposed to emit light the luminous intensity of which selectively energizes the photoresistor to control conduction of the signal output to the reproducing means and secure variation in the volume of sound thereat.

The herein disclosed preferred embodiment of the invention is characterized by interrelated coactive elements that can be included in a swell pedal assembly and readily incorporated in circuit with the tone signal output system and the electroacoustic signal reproducing means of an electrical musical instrument and operated by the player to control the decibel level of sound at the reproducing means. The principal feature of the invention is the use of light the luminous intensity per se of which is insufficient to excite a photoresistor coupling between the signal output system and the electroacoustic reproducing means of the instrument, which said light is emitted by an incandescent bulb energized by direct current of low voltage. To utilize the light to excite the photoresistor means the bulb is selectively movable in a linear direction between minimum and maximum extremes to cause variation in exciting brightness of light falling on the photoresistive means and proportional variation in the resistance and conductivity thereof and accompanying conduction of the signal output to the reproducing means and control of the decibel level of sound thereat.

An important feature of the invention is a photoelectric volume control system wherein one or any desired number of tone signal channels may be connected in circuit with respective reproducing systems and a common light signal source for conversion thereof from a minimum conductive electrical state to a selected variable conductive electrical state and conversely by photoelectric means in each of said channels all of which are common to a single light source and may be activated and deactivated by means such as the expression pedal of an organ or equivalent means for varying the relationship of the light source to the photoelectric means in the respective tone signal channels.

Other objects and advantages are:

The provision of an expression control which is highly dependable in operation, requires infrequent servicing; eliminates transient noises inherent in prior systems employing potentiometers, rheostats and similar devices for making and breaking circuit between a tone signal source and a reproducing system; is simple and may be economically manufactured, and is of a general construction enabling use thereof as a self-contained part of the expression pedal assembly of an organ and requires no change mechanically or otherwise in adapting it to the signal output circuit of an electric or electronic organ or other similar electrical musical instrument.

The invention consists substantially in the construction, combination, location and relative arrangement of parts and the method employed in connection therewith, all as will be more fully hereinafter set forth, as shown by the accompanying drawing and finally pointed out in the appended claims.

FIG. 1 is a view partly in section and partly in elevation of one exemplified embodiment of the invention.

FIG. 2 is a view in longitudinal section of the light responsive assembly showing the light source in its projected position relative to the light responsive device.

FIG. 3 is a perspective view of the light responsive device, the light source and the mounting board therefor showing the light source in its projected position.

FIG. 4 is a schematic view of one exemplified embodiment of the invention.

FIG. 5 is a view similar to FIG. 4 showing another exemplified embodiment of the invention.

FIG. 6 is a view similar to FIG. 4 showing a still further exemplified embodiment of the invention.

FIG. 7 is a detail sectional view showing the light source coupling means and interrelated guide rail.

In FIG 4, A is any well-known electric or electronic organ, the tone signal output of which has a preamplifier B, which, in turn, is coupled to a power amplifier D and associated electroacoustic transducer F via a light responsive device comprising a photoresistor C which may be of the type manufactured by or for General Electric Company of the United States of America and identified as "No. 65–15–188–5–G–E–B–430–G." Coactive with the light responsive device and mounted for reciprocal motion relative thereto is a light source consisting of an incandescent bulb **34** which may be of the type identified as No. 1819, also manufactured by or for said General Electric Company. The bulb is connected to a battery S, the voltage being relatively low in that only a minimum of light is required to obtain maximum conduction of photoresistor C, i.e., lowest resistance thereof; about on the order of 500 ohms when light of maximum luminous intensity falls thereon, the resistance increasing to several megohms when no light of exciting intensity strikes the photoresistor.

The resistance R of photoresistor C has one end coupled to the output of preamplifier B by a circuit lead wire W, the opposite end of the resistance connecting to ground through a 10K resistor **R1**, and as shown, a circuit lead wire **W1** couples amplifier D to the junction point P between resistance R and resistor **R1**.

When the light bulb **34** is moved a predetermined maximum distance away from the light responsive device as would be the case where the expression pedal of an organ is in a full "Off" condition, light from the bulb **34** is of insufficient luminous intensity to have any effect on resistance R, which is non-conductive and functions completely to prevent transmission of tone signal energy to amplifier D.

Like parts in the several figures of the accompanying drawing will bear like reference numerals and characters.

In carrying the invention into practice, use is made of a pedal expression assembly shown in detail in FIG. 1 as comprising a rigid horizontally disposed base plate **10** having at its rear end a vertical bracket **11** on which a foot pedal **12** is mounted for vertical tilting motion about a bushing **12** through which passes a supporting shaft **12*b***. The pedal consists of a longitudinal rigid metallic plate **14** faced at its upper surface with resilient material **15**. Integral with bracket **11** is a stop extension **11*a*** disposed and arranged to limit pivotal motion of the pedal from a full "Off" to a full "On" condition, said extension having a resilient stop bumper **17** adapted to freely engage the rear end of plate **14**. Loosely encircling the bushing **12** is a steel coil spring **18** having a long extremity **19** attached

at **20** to plate **14** and a short extremity **21** attached at **22** to said bracket **11**, the function of the spring being to cause the convolutions thereof to resiliently grip the bushing clutchlike and automatically retain the pedal in any selected position of tilted adjustment when pressure of the foot of the player is removed therefrom, and also to insure smooth operation of the pedal.

Forwardly of bracket **11** and attached to plate **10** is a vertical metallic stop member **23** having at its upper end a resilient stop bumper **24** for limiting tilting motion of the pedal in a clockwise directon between said bumper **24** and aforementioned bumper **17**.

In FIGS. 1, 2 and 3, a vertical rectangular panel board **25** of hard electrical insulating material is situated forwardly of stop member **23** and disposed transversely of plate **10** and supported by brackets **26**, **26** having bifurcated branches **26***a* attached to said plate by screw fastening means **27** enabling adjustment of the board longitudinally of said plate. Fixed to the board is a hollow tubular light housing **28** open at both ends and formed of hard smooth surfaced plastic material having electrical insulating properties. The front of the housing is flanged as at **28***a*, and as shown in FIG. 2 the housing extends horizontally through board **25** with the flanged end thereof firmly secured against one side of the board by a fastening element **30** at the opposite side of the board.

Telescopically received in said housing **28** are two interrelated hollow tubular members **29** and **30** of the same material as said housing. These members are nested partly within each other and firmly welded together to provided a substantially integral rigid body adapted for free reciprocal motion in said housing. Member **29** forms a receptacle for a lamp socket **31** having a bayonet slot **32** to receive the retaining stud **32***a* of the aforementioned incandescent light bulb **34**. The base of the lamp socket is contracted and passes through a U-shaped coupling member **35** and is upset against wall **36** thereof enabling attachment of circuit lead wires W2 and W3 to the light bulb **34**.

In FIG. 1 a motion imparting means consisting of a rigid steel rod M is pivoted at **37***a* to plate **14** of the expression pedal **12** and disposed forwardly of shaft **12***b*. The rod extends downwardly and forwardly, the lower end terminating in a trunnion M2 received in apertures M3 in the coupling **35** and having one end freely engaged with a rail M4 fixedly mounted on base plate **10** of the expression pedal assembly. As shown, the rail is disposed parallel to the axial center of housing **28**. A coil retractile spring M1 has one end attached to base plate **10** so that the spring has a toggle motion in response to push and pull actuation of said rod M enabling compensating to changes in tilting motion of said pedal and whereby the free end of the trunnion is resiliently maintained in operative riding engagement with said rail that uniform reciprocal motion is imparted to light bulb in a plane coaxial with said housing **28**.

Referring to FIG. 5, two photoresistors C are spaced apart from each other, each adapted to be connected in a signal transmission and reproducing system substantially in the manner shown and described in the description of FIG. 4. Coactive with both photoresistors for simultaneous activation and deactivation thereof is a light source consisitng of bulb **34** which is operable in the manner described in the description of FIG. 4.

Referring to FIG. 6, four photoresistors C are shown

spaced apart from each other and arranged to form a circular group. Each photoresistor is adapted to be connected to a signal channel individual thereto and having an amplifier and associated electroacoustic transducer as set forth in the description of FIG. 4, the respective channels being common to a light source **34** which we can assume is mounted for reciprocal motion respectively into and out of the field of activating sensitivity of said photoresistors enabling converting the resistances thereof from a non-conductive electrical state into a variable conductive state in response to selected reciprocal motion of said light source. The resistance of the photoresistors are of the same impedance value, the reason being that ordinarily, in each channel of a stereophonic organ the expression should be the same, i.e., about on the order of 25 decibels.

Functionally, all of the several embodiments of the invention are the same, the difference being merely in the number of tone signal channels and interrelated light responsive devices in circuitry including one or more reproducing systems, in each embodiment only a single light source being required for controllng activation of the light responsive devices.

While we have shown and described several embodiments of the invention respectively differing from each other only by the number of tone signal channels and associated light responsive device, this is by way of illustration as the number can be increased according to the type of musical instrument and the number of reproducing systems used as would be the case in some stereophonic systems.

What we claim as our invention is:

1. A swell control for a musical instrument having a tone signal output system and a signal reproducing system, said control comprising, a photoresistor coupling the tone signal output system to the reproducing system, an incandescent light bulb of low voltage selectively movable in a housing enabling light of desired luminous intensity to activate the photoresistor and thereby control conduction of the signal output to said reproducing system, and a panel board at one side of which the photoresistor is mounted and at the other thereof the housing is mounted and opens onto the light exciting field of the photoresistor.

2. A swell control according to claim **1** wherein the housing, the panel board and the light bulb are all thereof elements of a swell pedal assembly having motion imparting means responsive to operation of the pedal of said assembly for moving the light bulb between two linearly spaced apart positions in said housing.

3. A swell control according to claim **2** wherein there is included in said assembly means for maintaining the pedal in any desired position of tilted adjustment.

References Cited

UNITED STATES PATENTS

1,956,350	4/1934	Hammond	84—1.27 X
2,822,429	2/1958	Watson	179—100.3
3,318,991	5/1967	Cookerly et al.	84—1.27 X
3,374,316	5/1968	Slaats et al.	84—1.27 X

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