Oct. 17, 1950 W. H. BRUNS 2,525,769

CONTROL FOR ELECTRIC CIRCUIT

Filed June 5, 1948

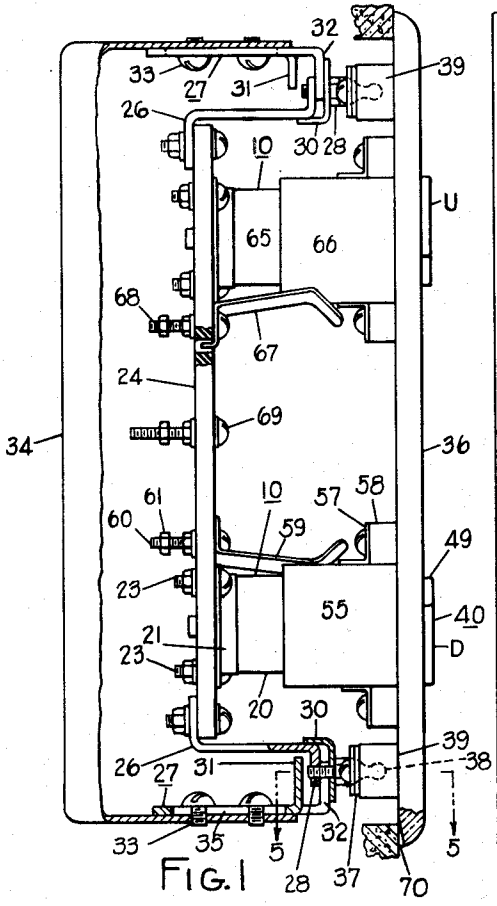

FIG. 1

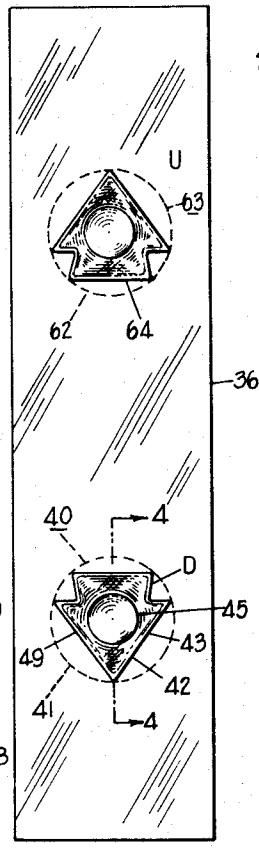

FIG. 2

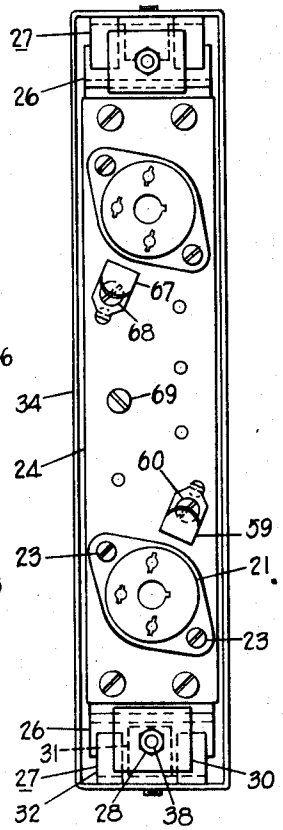

FIG. 3

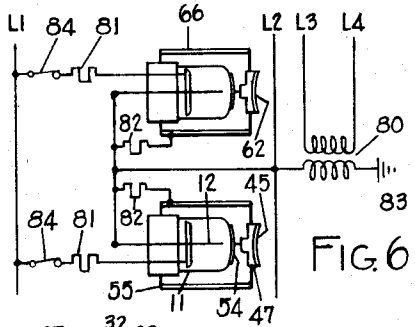

FIG. 6

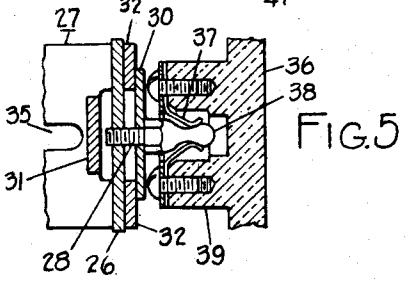

FIG. 5

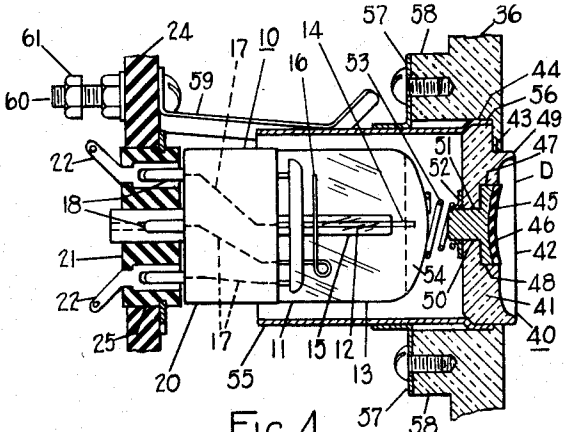

FIG. 4

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2,525,769

CONTROL FOR ELECTRIC CIRCUIT

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Application June 5, 1948, Serial No. 31,293

21 Claims. (Cl. 315—201)

1

The invention relates to controls for electric circuits and is a continuation in part of the co-pending application of William Henry Bruns, Serial Number 604,185 filed July 10, 1945, for Control for Electric Circuits.

In certain electric circuits it is desirable to control the circuit in response to some manual operation. In elevator control systems for example, push buttons and other manually operable switches are provided for operation by passengers and intending passengers and by car attendants for performing certain operations. There are certain advantages in utilizing electronic tubes as controls for electric circuits. They are positive and reliable in operation and have no moving parts. It is desirable, especially when the tubes are utilized to control circuits of elevator systems, to control these tubes through the medium of buttons. It is of advantage that the tubes be cause to operate simply by touching the buttons.

It is the object of the invention to provide an organization embodying an electronic tube controlled by touch wherein the possibility of unwanted operations is minimized.

In carrying out the invention, a cold cathode gas tube is utilized. The button is of conducting material and on the surface which is touched to fire the tube there is a layer of dielectric material which may be relatively thick or simply a thin layer, depending upon the dielectric constant of the material. The back of the button is connected for controlling the breakdown of the tube. A source of current, which is either direct or periodic depending on the purpose for which the tube is employed, is provided for the anode-cathode circuit of the tube. A second source of current which is periodic is provided for the firing circuit. The circuits are arranged so that when the front of the button is touched a capacitor is formed by the button and the finger of the person who touches the button thus completing the firing circuit.

The invention will be described as a control for an elevator system, such for example as that disclosed in the co-pending application of William Henry Bruns, Serial No. 696,313, filed September 11, 1946, now Patent No. 2,468,289. In carrying out the invention as applied to the registration of a call from a landing according to the arrangement which will be described, an electronic gas tube in a glass envelope is provided in the touch button fixture. The fixture has a face plate of insulating material. The touch button is arranged in the fixture face plate adjacent

2

the tube. The front of the button is of a material of a high dielectric constant while the back of the button is of electrically conductive material. On the envelope of the tube adjacent the anode is a coating of electrically conductive material which is connected to the back of the button. A source of direct current of a certain voltage value is connected to the anode-cathode circuit of the tube. A source of alternating current of a certain voltage value is connected on one side to the anode-cathode circuit and on the other side to ground. With this arrangement, when a person touches the button the conductive coating is connected to ground through the capacitor formed by touching the button, thus completing the firing circuit. As a result, the tube breaks down and remains conductive, registering the call and enabling the touching of the button to be discontinued. When the call is answered a control operation takes place to reduce the potential difference between the anode and cathode to below sustaining value. This puts out the tube, cancelling the call. A shield for the tube and button is connected to a point in the anode-cathode circuit, thus shielding the tube from unwanted firing by capacitive effects due to grounded portions of the fixture. This connection is effected through a resistor to minimize the shock hazard when working on the control. Where an up landing control and a down landing control are arranged as a unit, separate resistors are provided in the shield circuits to prevent the firing of one tube when the button for the other tube is touched, as for example when the body of the person touching the tube has an electrostatic charge. In the case of a combination up and down control unit, the connections from the shields through their resistors are preferably made respectively to the anodes of the tubes for which the shields are provided. With alternating current voltage applied to the anode-cathode circuit of the tube, the tube is conductive only so long as the button is touched.

In many cases where electric circuits are manually controlled, it is desirable to indicate whether or not the manual operation has been effected. With an electronic control the tube itself may be employed to provide this indication by utilizing the light from the tube as the indicator. The conductive coating utilized on the tube envelope is of a transparent material, this being the subject matter of the copending application of William Henry Bruns, Serial Number 769,035, filed August 16, 1947. A window of translucent material is arranged around the button. This

window transmits the light from the tube to the person touching the button. The window projects beyond the button to minimize accidental touching of or brushing of clothes against the button to cause unwanted firing of the tube. This window is preferably in the shape of an arrow, pointing upwardly in the case of an up button and downwardly in the case of a down button. The face of the arrow is sloped inwardly to improve the visibility of the transmitted light and to facilitate the touching of the button.

Features and advantages of the invention will be apparent from the above statements and from the description which follows and appended claims.

In the drawings:

Figure 1 is a side view of a landing button fixture with up and down controls embodying the invention, with parts in section;

Figure 2 is a front view of the same;

Figure 3 is a front view of the fixture with the face plate and tubes removed;

Figure 4 is an enlarged side view of one of the controls, with parts in section along the line 4—4 of Figure 2;

Figure 5 is a detail taken along line 5—5 of Figure 1; and

Figure 6 is a simplified wiring diagram for the controls.

Referring first to Figures 1 and 2, the landing button fixture therein illustrated provides both an up control U and a down control D. Inasmuch as these controls are of the same construction, only one of them, namely the down control positioned in the lower half of the fixture, will be described, details of this control being illustrated in Figure 4 to which reference should also be made. A cold cathode gas tube 10 is utilized. A tube having a wire anode such as the RCA 1C21 but without the paint on the outside of the glass envelope has been found satisfactory and has been illustrated. This tube has an annular shaped cathode 11. The wire anode 12 extends through the central opening of the cathode and perpendicularly to the cathode to within a short distance of the top of the glass envelope 13. All but the top 14 of the anode is surrounded by a glass sleeve 15. 16 is a wire loop usually termed a starter electrode. 17 are conductors schematically indicated for connecting these electrodes to the prongs 18 extending from the base 20 of the tube. These prongs extend into apertures in a socket 21. The socket is provided with tabs 22 for making external electrical connections, these tabs being connected to the prongs when the tube is inserted in the socket. Only the tabs connected to circuits are shown. The starter electrode, if not used, is connected externally to the cathode.

The socket is secured by bolts 23 to a mounting block 24 of insulating material. An aperture 25 is provided in this block through which the socket extends. The mounting block is provided at its ends with brackets 26 which are secured to brackets 27 by studs 28 and clamp plates 30. Each of brackets 27 is formed with a stop portion 31 and two side portions 32 which extend vertically, the clamp plate 30 spanning the side portions and the stud 28 extending between the side portions into the vertical arm of bracket 26. Brackets 27 in turn are adjustably secured by screws 33 to the outlet box 34, an elongated adjustment aperture 35 being provided in each bracket. The fixture face plate 36, also of insulating material, is secured to the outlet box 34 by spring latches 37 which snap over the ball shaped ends 38 of studs 28. These spring latches are secured by screws to insulating blocks 39 moulded on the back of face plate 36.

Immediately in front of the tube and extending through the face plate is a member 40 of light transmitting material such as lucite. The body portion 41 of this member is cylindrical and is concentric with the tube. The remaining portion 42 of the member which projects past the front of the face plate is in the shape of an arrow which points downwardly. The face plate is formed with an aperture 43 to conform to the arrow and through which the arrow portion 42 extends. In back of the aperture 43, the face plate is formed with a depression 44 to receive the cylindrical body portion 41.

A button 45 is mounted in member 40 and extends through the face of the arrow portion 42 to enable it to be touched by a person. The button has a front portion 46 of insulating material of a high dielectric constant joined as by moulding to a back portion 47 of conductive material. The front of the button serves as the dielectric of a capacitor, one plate of which is the back of the button and the other plate the finger of the person touching the button. The front of the button may be of such material as a phenol formaldehyde which has a high dielectric constant and a high volume resistivity. The thickness of the material forming the front of the button is dependent on the dielectric constant of the material used. For example, for a material having a dielectric constant of around 7, a thickness of one thirty-second of an inch has been found satisfactory.

A depression 48 is formed in member 40 to receive the button, extending from the face of the arrow portion into the body portion and centrally with respect to the body portion. The arrow portion 42 extends well beyond the front of the face plate and from its edges 49 is dished backwardly. Also the depth of depression 48 is such that the face of button 45 is considerably back from the edges 49 of the arrow portion. The front of the button is preferably concave to insure ample area of contact of the touching finger.

An aperture 50 extends from the depression 48 to the back of member 40. The back portion 47 of the button is provided with a shank 51 which extends through aperture 50 for a short distance in back of member 40. The button is held in place in member 40 as by a spring retaining washer 52 forced on shank 51. A spiral spring 53 connects the back portion 47 to the top of the glass envelope of the tube. This spring is cone shaped with the large end bearing against the tube envelope and the small end arranged on shank 51 and bearing against washer 52.

An area 54 on the outside of the envelope at the top is covered with a transparent electrically conductive material such as that manufactured by the Pittsburgh Plate Glass Company under the trade name "Nesa." For convenience, the outline of this area is indicated on the drawings by dotted lines but it is to be understood that actually the boundary line between this area and the rest of the envelope is indistinguishable. With this arrangement an electrical connection is provided from the back of the button to the spot on the outside of the tube envelope adjacent the anode. Also, when the tube is fired, the light from the tube passes through the arrow portion 42 to indicate that the call is registered. As the arrow portion ex-

tends well beyond the face plate, the indication of the call registration is visible from all angles. The area **54** on the top of the tube being covered with a transparent material, allows full transmission of light, thus giving a vivid indication of the registration. A thin coating of the conductive material is preferable as its reflects less light.

The tube and the button are shielded from the outlet box and other grounded elements of the fixture to prevent unwanted firing of the tube. This shield designated **55** is in the form of a tube of conducting material which is belled out at its front end **56** to receive body portion **41** of member **40** with a pressed fit. This end portion fits in depression **44** in the back of the face plate. The shield extends over a portion of the tube base **20**. A pair of oppositely disposed angle shaped straps **57** are secured as by soldering to shield **55**. These straps are secured as by screws to insulating blocks **58** moulded on the back of the face plate. Thus the shield and in turn the light transmitting member **40** and button **45** are firmly fixed in place on the face plate. A spring **59** of conducting material is secured as by a stud **60** to mounting block **24** in position to bear against the shield. Nuts **61** are provided on the stud for effecting the connection of the shield to the anode of the tube.

The up control U is symmetrically positioned in the upper half of the fixture. The button of the up control is designated **62** and the light transmitting member is designated **63** with its arrow portion designated **64**. Whereas the arrow portion of the down control points downwardly the arrow portion of the up control points upwardly. It is preferred to disperse the light transmitted by members **40** and **63** as by sand blasting their back surfaces. Also, when the face plates are somewhat translucent, the forward faces of these members, exclusive of the arrows, may be rendered opaque as by painting to prevent undesirable transmission of light when a tube is conductive. The paint used is of a color which will not render it visible by reflected light. It is also preferred to provide material for the fronts of the buttons of distinctive colors, green for up and red for down. The electronic tube of the up control is designated **65**. The shield **66** for this tube is connected by a spring **67** to a stud **68**. The various connections for the controls are effected through studs, one of which designated **69** is shown.

The face plate **36** is removed to replace a tube. This is done by inserting a screw driver into the slot **70** in the back of the plate at the bottom and using it as a lever to pry the spring latches **37** off the ball shaped ends **38** on studs **28**. The buttons **45** and **62**, the light transmitting members **40** and **63**, shields **55** and **66**, and contact springs **53** come off with the face plate as a unit.

The various connecting wires inside the outlet box and the wires leading to the fixture are not shown in Figures 1 to 5. Instead, a simplified wiring diagram is illustrated in Figure 6 to which reference may now be had. Two sources of current are illustrated, one source is indicated by lines L3 and L4 which feed a transformer **80**, the secondary of which is in the firing circuit. The other source, indicated by the lines L1 and L2 is applied to the anode-cathode circuits. Lines L3 and L4 are fed from an alternating current source. As the controls are utilized to register calls, lines L1 and L2 are fed from a direct current source so as to maintain each tube conducting once fired and thus to enable the finger to be removed. Line L2, which is the positive side of the direct current source, is connected to the anode **12** and line L1, which is the negative side of the source, is connected to the cathodes **11**. A load, indicated as a resistor **81**, is connected in each anode-cathode circuit. One side of the secondary of transformer **80** is connected to ground **83** and the other side connected to some point in the anode-cathode circuit of each tube, illustrated as connected to the anodes. The back portions **47** of buttons **45** and **62** are connected to the conductive spots **54** on the tubes for which the buttons are provided. Each of the shields **55** and **66** is connected to a point in the anode-cathode circuit of the tube for which it is provided, illustrated as connected in each case to the anode. This connection may be effected through studs **60** and **68** (Figure 1). A resistor **82** is provided in each connection. The electrodes **16** of the tubes are not shown as they are not used in the particular circuit arrangement illustrated.

The value of the voltage of the direct current source is between sustaining voltage and the breakdown voltage for the anode-cathode circuit of the tube. The peak voltage value of the transformer secondary is high enough to enable a person wearing gloves to break down the tubes by touching the fronts of the buttons but not so high as to result in unwanted operations. For the RCA 1C21 tube with a thin "Nesa" spot of about 1" diameter and for a button $\frac{5}{8}$" in diameter and a dielectric front $\frac{1}{32}$" thick and of the above specified characteristics, a 135 volt direct current source and a sixty cycles 175 R. M. S. volts transformer secondary voltage have been found satisfactory. The ohmic value of each of resistors **81** for this arrangement is 4000 ohms. This provides a voltage drop when the tube is conducting which may be utilized for various control operations and for other purposes such as controlling indicating devices. Each of resistors **82** is of an ohmic value of 500,000 ohms.

In operation, upon a person touching the front of either button **45** or **62** of either control a capacitor is formed and alternating current voltage is applied across the gap between the envelope and anode **12** of the tube of that control, the circuit being from one side of the transformer secondary to the anode and from the other side of the transformer secondary by way of ground through the person's body, the button and thus to the envelope. This voltage causes sufficient change in the field pattern of the tube to cause the tube to break down between the anode and cathode. As direct current voltage is applied to the anode-cathode circuit, the tube remains conductive when the person removes his finger so that the call remains registered. The light transmitted from the tube through the arrow indicates that the call is registered. The tube may be extinguished to cancel the call by reducing the potential difference across the tube to below sustaining value. In the circuit illustrated, a switch **84** is indicated in the anode-cathode circuit of each tube for this purpose, the switch being opened to extinguish the tube. In automatically cancelling calls, this operation is of only short duration so that at the expiration of this period switch **84** is reclosed to permit the registration of another call.

It is found that the current flow required to break down the tube in response to touch is in the nature of a fraction of a microampere. For this reason it is possible for the tube to be broken down by a person wearing gloves without utilizing a firing circuit voltage which might prove dangerous to persons manipulating the controls or servicing the system. The impedance of the gloves on say 60 cycles alternating current is fairly high but due to the small amount of current which will break down the tube the impedance drop is relatively low. The impedance drop across the button is also low due to its relatively large capacity and to the small amount of current flow. Thus the voltage which will overcome this impedance drop and that of the button and still fire the tube is of a safe value. This is of considerable advantage for elevator controls where passengers and intending passengers often wear gloves, as do car attendants.

Shock hazards when working on the controls are minimized by the inclusion of resistors 82 in the shield connections. In the case of a combination up and down control such as has been described, it is preferred to provide a separate protective resistor for each shield. With such arrangement, the possibility of the firing of both tubes upon the touching of the button for one of them by a person who has accumulated a high static charge, as by walking on a heavy carpet just prior to touching the button, is prevented. The high resistivity of the front portion of each button minimizes the possibility of unwanted firing of a tube by leaks from the button for that tube to ground, as due to the accumulation of dirt on the face plate, or by the accidental touching of clothing against the button. Also, the arrows, projecting beyond the face of the buttons, serve to protect the buttons from accidental touching. The inward dishing of the arrows facilitates touching of the buttons by persons' fingers.

While buttons having a dielectric material with the characteristics mentioned have been found satisfactory, other dielectric materials may be utilized, especially those having higher dielectric constants.

While a coating for the tube envelope of conductive material of about 1'' in diameter has been found satisfactory, other size areas may be employed. Also, while a transparent conductive material such as "Nesa" is preferred for coating the top of the tube envelope, other transparent conductive materials such as sputtered tin may be utilized. Also a translucent conductive material, a metal screen, or a material such as aquadag may be utilized when less vivid illumination is not considered objectionable. Also a tube without a conductive coating may be utilized for certain applications when ample area of contact with the tube envelope is made, as by using a metal screen connected to the button or employing a spring with ample area of contact. In certain instances, it may be of advantage to provide a negative bias of say —30 volts on the control electrode.

While the fixture of Figures 1, 2 and 3 is for two buttons, single button fixtures may be provided, as for example for the terminal floors. Also single button fixtures would be provided for intermediate floors in certain types of elevator systems, in which event the protruding portion of the light transmitting member may be of a different shape. These protruding portions may be of configurations different from arrows when the fixture is provided at intermediate floors. The light transmitting function could be dispensed with for certain installations or for certain operations in which event the buttons would be mounted in the face plate.

Where it is not desired to maintain the tube conductive when the touch is discontinued, alternating current voltage may be applied to the anode-cathode circuit of the tube, as by connecting lines L1 and L2 to an alternating current source. Controls in which alternating current voltage is applied to the anode-cathode circuit of a tube may be used for various purposes in elevator systems. For example such control might serve as a car button in the car to register a car call or as the control switch within the elevator car operable to start the car after each stop. In such case the protruding portion of the light transmitting member could be of some other shape, such as a ring. A construction similar to that of Figure 4 may be employed for such control but other constructions may be utilized dependent upon the purpose and location of the control.

While the invention has been especially directed to controls for use in elevator systems, it is to be understood that the controls may be used for other purposes.

Therefore as many variations may be made and as many apparently widely different embodiments of the invention can be made without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In combination; a gas tube having an anode and a cathode in an electrically non-conducting envelope; operating means including a member having a back of conductive material and an oppositely disposed face of dielectric material and forming when manually touched a capacitor connected to control said tube; a source of current for the anode-cathode circuit of the tube, said source having a voltage value above the sustaining voltage of the tube but insufficient of itself to cause breakdown of the tube; a source of periodic current having one side grounded and the other side connected to the anode-cathode circuit and of a voltage value for firing the tube only when, with said first named source of current connected to said anode-cathode circuit, said operating means is touched; and conductive means for electrically shielding said tube.

2. In combination; a cold cathode gas tube having an anode and a cathode in an electrically non-conducting envelope; electrically conductive means on the outer surface of the tube envelope adjacent the anode; operating means including a member having a back of conductive material and an oppositely disposed face of dielectric material and forming when manually touched a capacitor connected to said conductive means; a source of current for the anode-cathode circuit of the tube, said source having a voltage value above the sustaining voltage of the tube but insufficient of itself to cause breakdown of the tube; and a source of periodic current having one side grounded and the other side connected to the anode-cathode circuit and of a voltage value for firing said tube only when, with said first named source of current connected to said anode-cathode circuit, said operating means is touched.

3. In combination; a cold cathode gas tube having an anode and a cathode in an electrically non-conducting envelope; an electrically conductive coating on the outside of the tube envelope adjacent the anode; operating means including a member having a back of conductive material and an oppositely disposed face of dielectric material and forming when manually touched a capacitor connected to said conductive coating; a source of current for the anode-cathode circuit of the tube, said source having a voltage value above the sustaining voltage of the tube but insufficient of itself to cause breakdown of the tube; a source of periodic current having one side grounded and the other side connected to the anode-cathode circuit and of a voltage value for firing the tube only when, with said first named source of current connected to said anode-cathode circuit, said operating means is touched; and conductive means for electrically shielding said tube from ground.

4. In combination; a cold cathode gas tube having an anode and a cathode in a glass envelope; electrically conductive means covering a portion of the outer surface of the envelope adjacent the anode; a plate of electrically conductive material connected to said conductive means; means adhered to said plate and serving as a dielectric of a capacitor formed by said plate and a person's finger when said dielectric means is touched by said finger; a source of current for the anode-cathode circuit of the tube, said source having a voltage value above the sustaining voltage of the tube but insufficient of itself to cause breakdown of the tube; a source of alternating current having one side grounded and the other side connected to the anode-cathode circuit and of a voltage value to cause breakdown of the tube only upon said person touching the dielectric means with said first named source of current connected to said anode-cathode circuit; and an electrostatic shield connected to said anode-cathode circuit and surrounding said tube.

5. In combination; a cold cathode gas tube having an anode and a cathode in a glass envelope; electrically conductive means adhered to an area on the outside of the envelope adjacent the anode; a button formed of a plate of electrically conductive material and a layer of a material having a high dielectric constant adhered to said plate and serving as a dielectric of a capacitor formed by said plate and a person's finger when said layer is touched by said finger, said plate being connected to said conductive means; a source of direct current for the anode-cathode circuit of the tube, said source having a voltage value above the sustaining voltage of the tube but insufficient of itself to cause breakdown of the tube; a conductive shield for said tube connected to the anode-cathode circuit; and a source of alternating current having one side grounded and the other side connected to the anode-cathode circuit and of a voltage value to cause breakdown of the tube only upon said touch of said person's finger with said first named source of current connected to said anode-cathode circuit.

6. In combination; a cold cathode gas tube having an anode and a cathode in a glass envelope, said anode being in the form of a wire extending at its end close to the top of the envelope; a spot of electrically conductive material adhered to an area on the outside of the envelope adjacent the anode; a button having a front layer of insulating material of a high dielectric constant and a back layer of electrically conductive material connected to said conductive spot and being adapted to be touched on said front layer to form a capacitor; a source of direct current for the anode-cathode circuit of the tube of a voltage value to maintain the tube conductive once it is broken down but insufficient of itself to cause breakdown of the tube; an impedance in said anode-cathode circuit external of the tube; a conductive shield for said tube connected to said anode; a source of alternating current; and a firing circuit for said tube including a connection from one side of said alternating current source to ground and a connection from the other side of said alternating current source to a point in the anode-cathode circuit, said firing circuit being adapted to be completed by way of ground and the body of the person touching the front layer of said button to said conductive spot through said capacitor said alternating current source having a voltage value to cause breakdown of the tube only upon the completion of said firing circuit with said direct current source connected to said anode-cathode circuit.

7. In combination; a cold cathode gas tube having an anode and a cathode in a glass envelope; electrically conductive means adhered to an area on the outside of the envelope adjacent the anode; a button connected to said conductive means adapted to be touched to operate said tube; a source of current for the anode-cathode circuit of the tube, said source having a voltage value above the sustaining voltage of the tube but insufficient of itself to cause breakdown of the tube; a source of alternating current having one side grounded and the other side connected to the anode-cathode circuit and having a voltage value for causing breakdown of the tube only upon a person touching the button with said first named source of current connected to said anode-cathode circuit; and insulating means extending around and beyond said button for protecting the button against accidental touching.

8. In combination; a cold cathode gas tube having an anode and a cathode in a glass envelope; electrically conductive means adhered to an area on the outside of the envelope adjacent the anode; a button formed of a plate of electrically conductive material having a layer of a material of a high dielectric constant adhered to said plate and serving as a dielectric of a capacitor formed by said plate and a person's finger when said layer is touched by said finger, said plate being connected to said conductive means; a source of direct current for the anode-cathode circuit of the tube, said source having a voltage value above the sustaining voltage of the tube but insufficient of itself to cause breakdown of the tube; a source of alternating current having one side grounded and the other side connected to the anode-cathode circuit and having a voltage value for causing breakdown of the tube only upon said touch of said person's finger with said direct current source connected to said anode-cathode circuit; and an insulating member in which said button is embedded, said member projecting beyond said layer for protecting the button against accidental touching.

9. In combination; a cold cathode gas tube having an anode and a cathode in a glass envelope; a spot of electrically conductive coating on the outside of the envelope adjacent the anode; a button having its back of conductive material and its front of a material having a high dielectric

constant so that when its front is touched by a person's finger a capacitor is formed, said back being connected to said conductive coating; a source of direct current for the anode-cathode circuit of the tube, said source having a voltage value above the sustaining voltage of the tube but insufficient of itself to cause breakdown of the tube; a source of alternating current having one side grounded and the other side connected to the anode-cathode circuit and having a voltage value for causing breakdown of the tube only upon a person touching the button with said direct current source connected to said anode-cathode circuit; and a member of insulating material extending around said button and projecting beyond said front side of said button for protecting the button against accidental touching, said projecting portion of said member being tapered inwardly toward said button.

10. In combination; a cold cathode gas tube having an anode and a cathode in a glass envelope; a transparent electrically conductive coating on the outside of the envelope adjacent the anode; a button having its back of conductive material and its front of a dielectric material so that when its front is touched by a person's finger a capacitor is formed; a conical spring connecting the back of said button with the coating on the envelope of said tube adjacent said anode, with the large end of the spring at said tube; a source of direct current for the anode-cathode circuit of the tube, said source having a voltage value above the sustaining voltage of the tube but insufficient of itself to cause breakdown of the tube; a source of periodic current having one side grounded and the other side connected to the anode-cathode circuit and having a voltage value for causing breakdown of the tube only upon a person touching the front of said button with said direct current source connected to said anode-cathode circuit; an opaque face plate of insulating material; and a light transmitting member of insulating material extending around said button and through said face plate for transmitting light from said tube while conducting.

11. In combination; a cold cathode gas tube having an anode and a cathode in a glass envelope; a spot of transparent electrically conductive coating on the outside of the envelope adjacent the anode; an opaque cylindrical button having its back of electrically conductive material and its front of a material having a high dielectric constant so that when its front is touched by a person's finger a capacitor is formed, said back being connected to said conductive coating; a source of direct current for the anode-cathode circuit of the tube, said source having a voltage value above the sustaining voltage of the tube but insufficient of itself to cause breakdown of the tube; a source of alternating current having one side grounded and the other side connected to the anode-cathode circuit and having a voltage value for causing breakdown of the tube only upon a person touching the button with said direct current source connected to said anode-cathode circuit; an opaque face plate of insulating material; and a light transmitting member of insulating material extending around said button and through said face plate for transmitting light from said tube while conducting, the portion of said light transmitting member visible from the front of said face plate being in the shape of an arrow.

12. In combination; a cold cathode gas tube having an anode and a cathode in a glass envelope; a spot of transparent electrically conductive coating on the outside of the envelope adjacent the anode; a cylindrical button having a front layer of opaque material of a high dielectric constant and high volume resistivity and having a plate of electrically conductive material adhered to said front layer and connected to said spot, said front layer when touched by a person serving as the dielectric of a capacitor formed by said plate and the person's finger, said front layer being concave to fit said finger and thus facilitate the forming of the capacitor; a source of direct current for the anode-cathode circuit of the tube, said source having a voltage value above the sustaining voltage of the tube but insufficient of itself to cause breakdown of the tube; a source of alternating current having one side grounded and the other side connected to the anode-cathode circuit and having a voltage value for causing breakdown of the tube only upon a person touching said front layer with said direct current source connected to said anode-cathode circuit; an opaque face plate of insulating material; and a light transmitting member of insulating material extending around said button through said face plate and projecting beyond said front layer of said button for protecting the button against accidental touching and being dished inwardly to facilitate touching the button, said member acting when said tube is conducting to transmit light therefrom through said face plate and said member projecting beyond said face plate to render such light visible from an angle.

13. In combination; a cold cathode gas tube having an anode and a cathode in a glass envelope, said anode extending toward the top of said envelope; a spot of transparent electrically conductive coating on the top of said envelope; a cylindrical button in front of said tube having a front layer of opaque material of a high dielectric constant and high volume resistivity and having a plate of electrically conductive material adhered to said front layer, said front layer when touched by a person serving as the dielectric of a capacitor formed by said plate and the person's finger, said front layer being concave to fit said finger and thus facilitate the forming of the capacitor, and the back of said plate having a rearwardly extending shank; a conical spring having its small end on said shank and its large end engaging said spot for connecting said plate to said spot; a cylindrical shield extending over said tube from the base thereof to said front layer of said button and connected to the anode of the tube; a source of direct current for the anode-cathode circuit of the tube, said source having a voltage value above the sustaining voltage of the tube but insufficient of itself to cause breakdown of the tube; a source of alternating current having one side grounded and the other side connected to the anode-cathode circuit and having a voltage value for causing breakdown of the tube only upon a person touching said front layer with said direct current source connected to said anode-cathode circuit; an opaque face plate of insulating material; and a light transmitting member of insulating material in which said button is embedded so that only its front is exposed, said member having its front face formed in the shape of an arrow which extends through said face plate and projects beyond said front layer of said button for protecting the button against accidental touching and which is

dished inwardly to facilitate touching the button, and said member acting when said tube is conducting to transmit light therefrom through said face plate, said arrow projecting beyond said face plate to render such light visible from an angle.

14. In combination, a pair of cold cathode gas tubes each including an anode and a cathode in a sealed envelope; a source of current connected between each anode and its conjugate cathode, said source having a voltage value above the sustaining voltage of said tubes but insufficient of itself to cause breakdown of the tubes; a source of periodic current; a firing circuit individual to each of said tubes, said circuits each including a connection from ground to one side of said periodic source and a second connection from the other side of said periodic source to the anode-cathode circuit of a respective tube, and each of said circuits being adapted to be completed by a person by way of ground, through the body of said person to the envelope of said respective tube; said periodic source of current having a voltage value sufficient to cause breakdown of a tube only upon completion of said firing circuit for said tube with said first named source of current connected to the anode-cathode electrodes of said tube; and an electrical shield surrounding and individual to each of said tubes, said shields being resistively interconnected by a resistor the midpoint of which is connected to the anode-cathode circuit of each of said tubes.

15. In combination; a pair of cold cathode gas tubes each having an anode and a cathode in a sealed envelope; a source of direct current connected between each anode and its conjugate cathode, said source having a voltage value above the sustaining voltage of said tubes but insufficient of itself to cause breakdown of the tubes; a source of recurring voltage impulses; conductive means individual to each tube, said means being contiguous to the outer surface of the tube envelope at a point adjacent the anode; a button individual to each tube and having a conductive back electrically connected to the conductive means of its respective tube; said button being adapted to be touched by a person to fire the tube; a firing circuit individual to each tube, each of said circuits including a connection from ground to one side of said impulse source and a second connection from the other side of said impulse source to the anode-cathode circuit of a respective tube, each of said circuits being adapted to be completed from ground to the conductive means on the envelope of its respective tube by the action of a person touching the button connected to said conductive means; said recurring voltage impulses having a voltage value sufficient to cause breakdown of the tube only upon said completion of said firing circuit with said first named source of current connected to the anode-cathode electrodes of said respective tube; an electrical shield individual to and around each of said tubes; a resistor interconnecting said shields; and a direct connection between the midpoint of said resistor and the anode-cathode circuit of each of said tubes.

16. In combination; a cold cathode gas tube having an anode and a cathode in a sealed envelope; a layer of electrically conductive material on the outer surface of said envelope and adjacent said anode; a source of current for the anode-cathode circuit of said tube and being of a voltage value above the sustaining voltage of the tube but insufficient to alone cause breakdown of the tube; a button having a conductive back surface and a dielectric covered front surface, said back surface being electrically connected to said layer of conductive material; a source of periodic current; a firing circuit for said tube, said circuit extending from ground through said source to the anode of said tube and adapted to be completed from said conductive material to ground through the capacitive coupling formed by said button and the body of a person that touches said button front surface; said source of periodic current having a voltage value sufficient to cause breakdown of said tube only upon a person touching said button with said direct current source connected to the anode-cathode circuit; a shield comprising conductive material surrounding said tube and button; and a resistor individual to said shield and interconnecting only said shield and the anode-cathode circuit of said tube.

17. In combination; a cold cathode gas tube comprising a cathode electrode and an anode electrode in a sealed envelope, and a layer of conductive material contiguous to the outer surface of said envelope and adjacent one of said electrodes; a source of anode-cathode current for said tube, said source being of a voltage value above the sustaining voltage of said tube but insufficient of itself to cause breakdown of the tube; a button having a conductive back surface that is electrically connected to said layer of conductive material and a non-conductive front surface, said button constituting one plate and the dielectric of a capacitive coupling between said layer of conductive material and ground when its front surface is touched by a person's finger; a two-terminal source of periodic voltage, a connection between ground and one of said terminals; a connection between the other of said terminals and one of said tube electrodes, said periodic source being of sufficient magnitude to initiate breakdown of said tube only when said circuit is completed between said layer of conductive material and ground with said source of anode-cathode current connected to said electrodes; and an electrostatic shield surrounding said tube, said shield being connected to the anode-cathode circuit of said tube.

18. A manually operable control comprising; a face plate; a cold cathode gas tube in back of said face plate; a light transmitting member for conducting light from the tube when ignited through said face plate; a button comprising a plate having one surface of conductive material and an oppositely disposed surface of dielectric material, said button forming one plate and the dielectric of a capacitor, said button being embedded in the light transmitting member with the dielectric in front; and means for electrically connecting said capacitor plate to the envelope of said tube.

19. A manually operable control comprising; a face plate; a cold cathode gas tube extending toward said face plate from the back thereof, said tube having an anode and a cathode; a light transmitting member projecting through said face plate in front of the tube for conducting light from the tube when ignited through said face plate, said member as viewed from the front of said face plate being in the shape of an arrow; a button comprising a plate having a back surface of conductive material and an oppositely disposed front surface of dielectric material, said button forming one plate and the dielectric of a capacitor, said button being embedded in the light

transmitting member with the dielectric in front; and means for electrically connecting said capacitor plate to the envelope of said tube at a point adjacent said anode.

20. A manually operable control comprising; an opaque face plate of insulating material; a cold cathode gas tube extending toward said face plate from the back thereof, said tube having an anode and a cathode with the anode extending to near the top of the tube envelope; a light transmitting member projecting through said face plate in front of the tube for conducting light from the tube when ignited to the front of the face plate, said member as viewed from the front of said face plate being in the shape of an arrow; an opaque button having a front and back portion, the front portion being of material of a high dielectric constant and the back portion being of electrically conductive material, said button being embedded in the light transmitting member with the front exposed; and a conical spring electrically connecting the back portion of the button to the top of said tube envelope with its large end engaging said envelope.

21. A manually operable control comprising; an opaque elongated face plate of insulating material; a cold cathode gas tube extending toward the back of the face plate, said tube having an anode and a cathode with the anode extending to near the top of the tube envelope; a coating of conductive material on the top of the envelope of said tube; a light transmitting member projecting through said face plate in front of the tube for conducting light from the tube when ignited to the front of the face plate, said member as viewed from the front of said face plate being in the shape of an arrow pointing toward one end of the face plate; an opaque button having a front and back portion, the front portion being of material of a high dielectric constant and the back portion being of electrically conductive material, said front portion when touched by a person serving as the dielectric of a capacitor formed by said back portion and the person's finger, said button being embedded in the light transmitting member with the front exposed; and a conical spring electrically connecting the back portion of said button to the coating on said tube with its large end engaging said coating.

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