

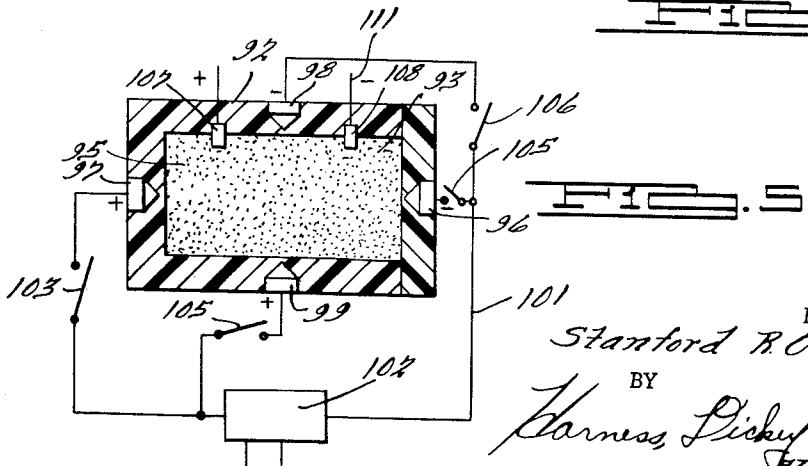
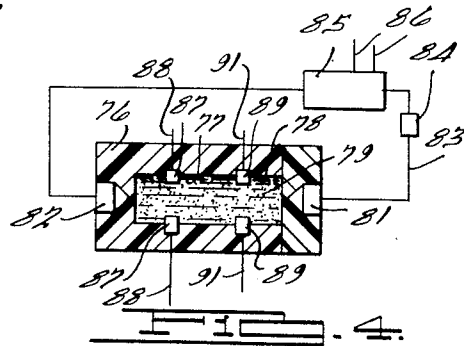
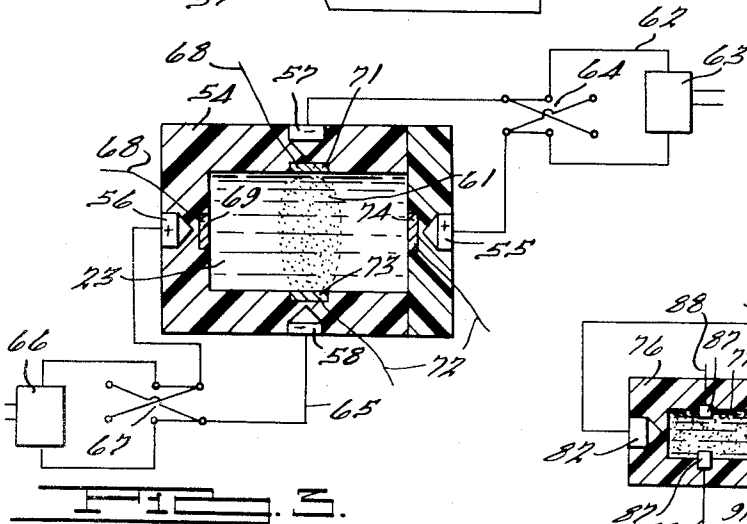
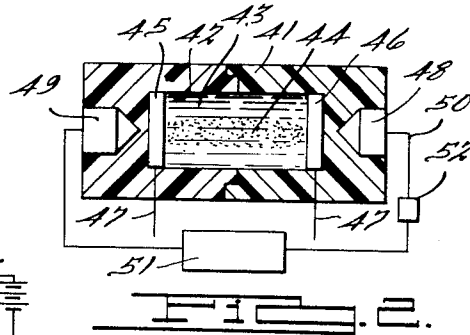
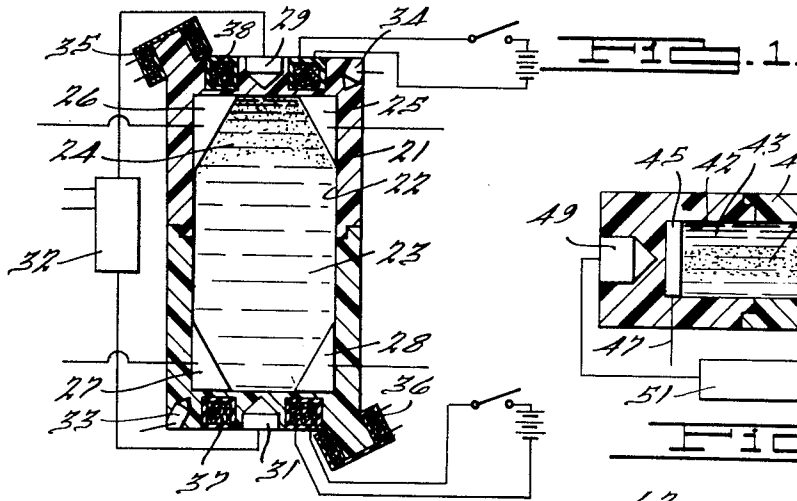
Dec. 15, 1959

S. R. OVSHINSKY

2,917,599

SIGNAL RESPONSIVE DEVICE

Filed April 7, 1958



INVENTOR.

Stanford R. Ovshinsky

BY

Harness, Pichey & Pichey
ATTORNEYS.

1

2,917,599

SIGNAL RESPONSIVE DEVICE

Stanford Robert Ovshinsky, Detroit, Mich., assignor to Tann Corporation, Detroit, Mich., a corporation of Michigan

Application April 7, 1958, Serial No. 726,662

17 Claims. (Cl. 200—87)

This invention relates to control devices and particularly to a circuit control device responsive to signals applied thereto.

The device of the present invention embodies a housing enclosing a chamber containing a dielectric fluid in which conducting particles are maintained in suspension. Electrodes are provided at the ends of the housing energized from a high potential voltage source for producing a large difference of potential across the electrodes to accumulate and compact the particles to form a conducting path. Such a path may be formed across a pair of contacts adjacent to one end of the body or across the contacts adjacent to the opposite end thereof. When the contacts are so bridged by the abutting particles, a circuit is completed thereby. Coils may be mounted at each end of the housing adjacent to or surrounding the electrodes and energized from a source of current to produce magnetic fields. Such fields will act upon the particles when of conducting magnetizable material, and the grouping of the particles by the field will produce a conducting path across a pair of the contacts. The degree of conductivity of the path will depend upon the strength of the field applied to the particles. Similarly, coils may be mounted diagonally across corners at opposite ends of the housing which will complete a circuit across a diagonal path between contacts located at opposite corners of the housing. The coils will compact the particles along a line diagonal between a set of the contacts located at opposite corners within the housing. In this manner different circuits may be completed under the control of current signals to the coils which produce the magnetic fields or under the control of the high potential voltage to the electrodes, or both, depending upon the kind and number of circuits which are to be controlled by the compacting of the particles. An electrode may be mounted in each of the four sides of a housing, any one of which may be connected to a high potential voltage source for grouping and compacting the particles which are suspended in the dielectric liquid within the interior of the housing. Contacts are associated with each of the electrodes connected in different circuits which may be bridged by the particles when compacted along lines extending across opposite sides of the housing when the respective electrodes thereof are energized from the voltage source or when the electrodes of adjacent sides are energized to have opposite polarities for compacting the particles diagonally across the corners between the contacts in the adjacent sides to complete a circuit through the adjacent contacts. The housing having the electrodes in the four sides may have a porous body on the interior containing conductive particles which would not complete a path across a pair of contacts extending into the body until a signal is applied to the electrodes. The high potential voltage source may be connected to the electrodes through individual switches so that the particles may be compacted across the opposite sides or across the corners to form a conducting path or paths which complete a circuit or circuits bridged thereby. The

2

difference in potential between the electrodes controls the amount of compacting, the higher the difference the greater compacting and therefore the better conducting path provided so that a greater amount of current may be transferred through the circuit.

Accordingly, the main objects of the invention are: to provide a device having a plurality of conducting particles suspended in a dielectric liquid which are grouped and compacted to form a conducting path across a pair of contacts to complete a circuit; to provide a dielectric liquid within the interior of the housing having conducting particles suspended therein and rendered conductive by the application of a high potential voltage field or a magnetic field, or both, thereto for grouping the particles and forming a conducting path which bridges the contacts to complete a circuit thereacross; to provide a porous body within the interior of a housing containing conducting particles which are grouped in conducting relation to complete a circuit by a change of conductive state of said porous body by a voltage field or a magnetic field, or both; to control the passage of current in a circuit connected to a pair of spaced contacts by grouping suspended particles to form a conductive bridge across the contacts under the influence of a voltage or magnetic field; to control the passage of current in a circuit connected to pairs of spaced contacts when compacting particles suspended in a dielectric liquid by a voltage or magnetic field, or both, producing conductive paths across pairs of spaced contacts, and, in general, to provide a control device which is simple in construction, positive in operation, and economical of manufacture.

Other objects and features of novelty of the invention will be specifically pointed out or will become apparent when referring, for a better understanding of the invention, to the following description taken in conjunction with the accompanying drawing, wherein:

Figure 1 is a sectional view in elevation of a device embodying features of the present invention;

Fig. 2 is a view of structure similar to that illustrated in Fig. 1, showing another form of the invention;

Fig. 3 is a view of a device similar to that illustrated in Figs. 1 and 2, showing a still further form of the invention;

Fig. 4 is a sectional view of structure similar to that illustrated in Fig. 2, showing a further form which the invention may assume, and

Fig. 5 is a view of structure similar to that illustrated in Fig. 3 in which conducting material is illustrated as being employed with an element having a porous body.

The present invention embodies a device which controls the flow of current when employing a dielectric fluid containing minute particles which form a conducting path through the fluid when moved into conducting relationship with each other. This may be done by employing a high potential field, by utilizing a magnetic field, or by charging the particles to cause them to respond to a given signal. In Fig. 1, for example, an insulating body 21 has a hollow interior 22 filled with a dielectric liquid 23. The liquid contains a plurality of minute particles 24 which in the present instance are conductive so as to form a conducting bridge between contacts when moved into contiguous relationship to each other. A pair of contacts 25 and 26 may be employed at one end of the body and a pair of contacts 27 and 28 may be employed at the opposite end thereof. When the particles 24 bridge the contacts 25 and 26, a circuit is completed thereacross. When the particles bridge the contacts 27 and 28, a circuit is completed thereacross while the circuit is interrupted across the contacts 25 and 26. By the application of the field or fields in the proper manner, the particles 24 may bridge the contacts 25 and 26 and 27 and 28 to complete both circuits or to be dispersed

and moved therefrom to interrupt both of the circuits. Thus, by the application of voltage from a source 32 to the end electrodes 29 and 31, a desired difference of high potential voltage is provided thereacross which forms clumps of the particles adjacent to the electrodes which bridge the adjacent contacts to make a circuit. When the voltage repels the particles at the electrodes, they move out of bridging relationship to the contacts to thereby interrupt the circuit or circuits. When employing a relatively low voltage, the particles will form a clump adjacent to one of the electrodes 29 or 31 and thereby bridge the adjacent pair of contacts to complete a circuit thereacross while the circuit at the other pair of contacts remains open. At a higher voltage the particles will be agitated and move lengthwise between the ends of the body and form conducting chains between the contacts 26 and 27 and the clumping of the particles across the contacts 25 and 28 across which a circuit will also be completed. This higher voltage could be applied at the opposite corners of the spaced ends of the body as to electrodes 33 and 34, which will cause the agitation of the particles and the accumulation of a chain or chains thereof between the contacts 25 and 27 to complete a circuit diagonally across the body. A similar set of electrodes could be used at the opposite corners to produce the accumulation of chains of the particles between the diagonally located contacts 26 and 28.

A pair of magnetic coils 35 and 36 are shown at the corners of the body which when energized from a source of current produce a magnetic field which moves the particles into conducting relationship between the electrodes 26 and 28 when the particles are made of a magnetizable material. Similarly, the movement of the particles into conducting relationship at one or the other or at both ends of the body across the conductors 25, 26, 27 and 28 can be controlled by magnetic fields when the particles are made of magnetizable material. When magnetic particles are employed, a magnetic coil 37 may be provided adjacent to one end of the body, while a coil 38 is mounted at the opposite end thereof. It will be apparent that the energization of one of the coils will cause the iron particles to clump or gather together adjacent to one set of contacts, and when de-energized and the opposite coil energized, the clump of particles will be broken up and the particles will move to the opposite end of the body to form a conducting bridge between the other set of contacts. Similarly, the chain of particles formed between the electrodes 26 and 28 when the field is produced by the coils 35 and 36 may be interrupted by the presence of a difference in potential across the electrodes 33 and 34 across opposite corners of the body. Thus, whenever the particles are maintained engaged to complete a circuit across a pair of contacts, a high potential voltage may be applied thereto to cause the particles to separate and thereby interrupt the circuit across the contacts. Thus, it can be seen that various types of energy in the nature of signals may be applied to the device to make and break a circuit or a plurality of circuits simultaneously between the plurality of contacts 25, 26, 27 and 28 when bridged by a conducting group of particles.

Various types of dielectric fluid may be employed in the chamber within the body of the device. Silicon fluid was successfully employed in which the frequency of movement of particles was controlled by its viscosity. For example, .65 Dow Chemical 200 fluid permitted a rapid movement of the particles therein. A heavier fluid, such as #50 Dow Chemical 200, will slow down the movement of the particles. The dielectric fluid has the advantage of preventing an arc from forming, and if formed, to immediately quench the arc. It is within the purview of the invention to employ dielectric particles having a higher degree of insulation properties than that of the dielectric liquid which can be charged by the applied potential and caused to collect adjacent to a current

path to provide further assurance against the passage of a current or to quickly de-ionize an arc path if an arc has been established. Higher voltages may be employed when using the dielectric fluid as it will prevent the breakdown of the medium through which the voltage is passing. This permits the ball to receive a higher amount of charge which increases its speed of oscillation beyond that which would be possible in air. This higher amount of energy imparted to the ball provides it with a greater impact and ability to move against gravity and against other forces opposing its movement. When the unit operates in a vertical position, the particles may be suspended at some point between the ends of the body. Thus, there is a migration of particles at certain potentials at an associated speed, and depending upon the viscosity of the dielectric fluid, there is a clumping of particles at a certain voltage. There is a tremendous amount of individual particle activity each repulsing the other in rapid movement at a higher voltage. This causes the formation of a chain of particles lengthwise of the body to complete a circuit between contacts 26 and 27 and/or contacts 25 and 28.

In Fig. 2 a device similar to that illustrated in Fig. 1 has a body 41 and an internal chamber 42. A dielectric liquid 43 is contained within the chamber and is provided with a plurality of conducting particles 44 retained in suspension therein. A pair of contacts 45 and 46 are mounted at opposite ends of the chamber 42 and are connected in a circuit 47. An electrode 48 is mounted at one end of the body and a similar electrode 49 is provided at the opposite end thereof. The electrodes are connected by a circuit 50 to a source of voltage 51 through a signal actuated device 52 which makes and breaks the circuit. Upon receiving a proper signal, the device 52 completes a circuit to the electrodes 48 and 49 from the voltage source 51 to thereby cause a clumping of the particles 43 between the contacts 45 and 46 to thereby complete the circuit 47. When the signal is no longer received by the device 52, the circuit 50 will be interrupted and the abutted particles 44 will be dispersed to interrupt the circuit between the contacts 45 and 46.

Referring to Fig. 3, a further form of device is illustrated, that having an insulating body 54 containing electrodes 55 and 56 at opposite ends and electrodes 57 and 58 transversely across the body. The chamber in the interior of the body contains a dielectric liquid 23, such as that hereinabove referred to, containing a plurality of conducting particles 61. The electrodes 55 and 57 are connected into a circuit 62 containing a high potential voltage source 63 and controlled by a double-pole, double-throw switch 64. The electrodes 56 and 58 are connected by a circuit 65 to a voltage source 66 controlled by a double-pole, double-throw switch 67. As herein illustrated, the electrodes 55 and 56 have the same polarity, while the electrodes 57 and 58 have the opposite polarity. This will cause a repulsion of the particles across the electrodes and the clumping of the particles between the electrodes 56 and 57 and 55 and 58. Through the operation of the switch 64 to its second position, the electrode 57 will have the plus sign and the electrode 55 the minus sign. As a result, the particles will be attracted to form a clumping of the particles between the electrodes 57 and 58 and between the electrodes 55 and 56. A circuit 68 has a contact 69 adjacent to the electrode 56 and a contact 71 adjacent to the electrode 57. A circuit 72 has a contact 73 adjacent to the electrode 58 and a contact 74 adjacent to the electrode 55. When the particles are clumped between the electrodes 55 and 58, the circuit 72 is completed across the contacts 73 and 74, and when clumped between the electrodes 56 and 57, a circuit 68 is completed between the contacts 69 and 71. Upon reversing the switches 64 or 67 and the dispersion of the particles between the electrodes 57 and 58 and 55 and 56, both of the circuits 72 and 68 are interrupted. Thus it will be seen that by changing the position of

5

the switch 64 and/or 67, the polarity of the pairs of electrodes shown or of any number of pairs of such electrodes will be changed to produce the clumping or the dispersion of the particles in any part of the interior of the body to thereby complete or interrupt the associated circuits.

In Fig. 4 another control device is illustrated, that having an insulating body 76 containing a chamber 77 having a dielectric liquid 78, such as above mentioned, within the chamber containing particles 79 of graphite in suspension. An electrode 81 is mounted in the body at one end of the chamber and an electrode 82 mounted in the body at the opposite end thereof. The electrodes are connected in a circuit 83 containing a signaling device 84 from a voltage source 85 energized from a circuit 86. Contacts 87 are spaced apart across the intermediate portion of the chamber connected in a circuit 88. Contacts 89 are similarly spaced across the chamber 77 connected in a circuit 91. When a high potential voltage is applied to the electrodes 81 and 82, a pressure is produced upon the collective particles to cause them to become sufficiently compacted to pass a current across a pair of the electrodes 87 or 89 depending at which end of the body the compacting of the graphitic particles takes place. Upon an increase of voltage a greater compacting occurs through the increased pressure applied to the particles, resulting in a better conducting path which permits a greater amount of current to be carried by the circuits 88 or 91. As a result, the current which is carried by the circuits 88 and 91 is modulated by the amount of high potential voltage applied across the electrodes 81 and 82.

In Fig. 5 a further form of the invention is illustrated, that wherein an insulating body 92 has a body 93 of porous material in which a plurality of conducting particles 95 are loosely maintained. Electrodes 96 and 97 are mounted in the opposite end of the body 92. An electrode 98 is mounted in one side of the body diametrically opposite to an electrode 99 in the opposite side thereof. A circuit 101 connects the electrodes to a source of high potential voltage 102, controlled by switches 103, 104, 105 and 106. Any number of sets of contacts 107 and 108 may extend into the porous body 93 connected in a circuit 111 and interrupted by the porous material of the body 93 which is relatively nonconducting. It is only when the conducting particles 94 have a potential bias applied thereacross to produce a conducting path that the contacts 107 and 108 are conductively joined to complete the circuit 111. The porous material itself will not carry current, and the particles 95 are moved into conducting relationship by applying a high potential voltage thereon from pairs of the electrodes 96, 97, 98 and 99. This is accomplished by operating certain of the switches 103, 104, 105 and 106 and causing the particles to move into conducting relationship across a set of contacts, such as contacts 107 and 108, to complete the circuit 111. In this instance the circuit could have been completed by closing the switches 104 and 106 to provide a high potential voltage across the electrodes 99 and 98. A conducting path similarly would be provided if the high potential voltage was applied between the electrodes 96 and 97 by the closing of the switches 103 and 105 to group the particles 95 sufficiently to pass current across a set of contacts, such as contacts 107 and 108. It is very obvious that by increasing or decreasing the high potential voltage, the degree of conductivity through the path of the resulting grouped particles 95 can be changed. It is also obvious that by applying the high potential voltage to pairs of the electrodes independently or simultaneously, a degree of concentration of the conductive particles may be controlled within the porous body 93 to increase the conducting path between the contacts 107 and 108 to thereby pass a still greater amount of current through the circuit 111. Thus the conducting particles within the porous body 93 will produce substantially no

6

conducting path until a potential bias is applied across pairs of the electrodes 96, 97, 98 and 99. This occurs through the operation of the associated switch 103, 104, 105 and 106, the degree of conductivity depending upon the number of switches closed and the increase in the difference of potential between the electrodes. Similarly, the particles or chargeable means may have good dielectric properties which, when forced in the pores of the body 93 by the potential field across the electrodes, will increase the dielectric properties of the body and provide increased opposition to the passage of a current thereacross.

When the word "ball" is employed throughout the specification and claims, it is to be understood that a true spherical element is not necessarily referred to, since the element may be of any shape and may be in some instances a plurality of sizable elements or a greater number of small elements in the nature of chargeable particles which may be compacted to produce a conductive path. Thus, the chargeable means, whether a sphere or an irregular element or elements, or those which have been previously charged, will be affected by the charge applied by the difference of potential across the electrodes to change the conductivity across a pair of contacts, as herein disclosed. It is also to be understood that the elements and particles can be magnetic, conductive or nonconductive since they will be affected by the difference of potential across the electrodes to be moved in a manner to change the conductivity of a path, as hereinabove described. This change of state of the variable medium of the device will change the degree of conductivity of a path to interrupt or complete a circuit, as the case may be. Thus, it will be noted that the particles herein employed can be conducting or nonconducting or the conductivity can be changed by a change in the number of particles engaged or the amount of pressure applied thereto by the voltage or magnetic field. For example, carbon particles may have a force applied thereto by a non-mechanical field which will result in a substantial increase in conductivity to pass an increased amount of current therethrough. The particles may be of uniform size and shape or may be entirely nonuniform, but such particles must be of a size which may be readily charged and moved into compacting relationship to form a conducting path when the particles are of conducting material or a dielectric path when they are of insulating material.

What is claimed:

1. In a control device, a housing having an interior chamber, a dielectric liquid within the chamber, conducting particles within the dielectric liquid, and a pair of electrodes in said housing in spaced relation to each other energizable from a voltage source for producing an electrostatic field and charges which compact the particles to form a conducting path thereof.

2. In a control device, a housing having an interior chamber, a dielectric liquid within the chamber, conducting particles within the dielectric liquid, a pair of electrodes in said housing in spaced relation to each other energizable from a voltage source for producing an electrostatic field and charges which compact the particles to form a conducting path thereof, and a pair of contacts adjacent to one of said electrodes which are bridged by the conducting path formed by said particles.

3. In a control device, a housing having an interior chamber, a dielectric liquid within the chamber, conducting particles within the dielectric liquid, a pair of electrodes in said housing in spaced relation to each other energizable from a voltage source for producing an electrostatic field and charges which compact the particles to form a conducting path thereof, a pair of contacts adjacent to one of said electrodes which are bridged by the conducting path formed by said particles, and a second set of contacts adjacent to the other of said electrodes which are bridged by the conducting path when

the particles are compacted adjacent to said second electrodes.

4. In a control device, a housing having an interior chamber, a dielectric liquid within the chamber, conducting particles within the dielectric liquid, a pair of electrodes in said housing in spaced relation to each other energizable from a voltage source for producing an electrostatic field and charges which compact the particles to form a conducting path thereof, a pair of contacts adjacent to one of said electrodes which are bridged by the conducting path formed by said particles, a second set of contacts adjacent to the other of said electrodes which are bridged by the conducting path when the particles are compacted adjacent to said second electrodes, and a coil adjacent to each of said electrodes energized from a source of current to produce a magnetic field which compacts the particles and moves them into conducting relationship across the pair of contacts adjacent thereto.

5. In a control device, a housing having an interior chamber, a dielectric liquid within the chamber, conducting particles within the dielectric liquid, a pair of electrodes in said housing in spaced relation to each other energizable from a voltage source for producing an electrostatic field and charges which compact the particles to form a conducting path thereof, a pair of contacts adjacent to one of said electrodes which are bridged by the conducting path formed by said particles, a second set of contacts adjacent to the other of said electrodes which are bridged by the conducting path when the particles are compacted adjacent to said second electrodes, a coil adjacent to each of said electrodes energized from a source of current to produce a magnetic field which compacts the particles and moves them into conducting relationship across the pair of contacts adjacent thereto, and a coil at diagonal corners of said housing energized from a source of current to produce a magnetic field diagonally between contacts at the opposite corners of the housing to compact the particles and form a conducting path diagonally between said contacts.

6. In a control device, a housing having an interior chamber, a dielectric liquid within the chamber, conducting particles within the dielectric liquid, a pair of electrodes in said housing in spaced relation to each other energizable from a voltage source for producing an electrostatic field and charges which compact the particles to form a conducting path thereof, a pair of contacts adjacent to one of said electrodes which are bridged by the conducting path formed by said particles, a second set of contacts adjacent to the other of said electrodes which are bridged by the conducting path when the particles are compacted adjacent to said second electrodes, a coil adjacent to each of said electrodes energized from a source of current to produce a magnetic field which compacts the particles and moves them into conducting relationship across the pair of contacts adjacent thereto, a coil at diagonal corners of said housing energized from a source of current to produce a magnetic field diagonally between contacts at the opposite corners of the housing to compact the particles and form a conducting path diagonally between said contacts, and electrodes applied to opposite corners of the housing energizable from a voltage source for producing a conducting path by compacting the particles diagonally between contacts at opposite corners of the housing.

7. In a control device, a housing having an interior chamber, a dielectric liquid within the chamber, conducting particles within the dielectric liquid, a pair of electrodes in said housing in spaced relation to each other energizable from a voltage source for producing an electrostatic field and charges which compact the particles to form a conducting path thereof, a pair of contacts adjacent to one of said electrodes which are bridged by the conducting path formed by said particles, a second set of contacts adjacent to the other of

said electrodes which are bridged by the conducting path when the particles are compacted adjacent to said second electrodes, a coil adjacent to each of said electrodes energized from a source of current to produce a magnetic field which compacts the particles and moves them into conducting relationship across the pair of contacts adjacent thereto, and electrodes applied to opposite corners of the housing energizable from a voltage source for producing a conducting path by compacting the particles diagonally between contacts at opposite corners of the housing.

8. In a control device, a housing having a hollow interior, a dielectric fluid within said interior, pairs of contacts within said housing, spaced electrodes in said housing for producing an electrostatic field when energized, spaced coils on said housing energized by a current to produce magnetic fields across pairs of said contacts, conducting particles of magnetizable material suspended in said fluid and compacted by said fields to form conducting paths across the associated pairs of contacts, and additional coils at diagonal corners of the housing for compacting the particles and producing a conducting path between contacts at diagonal corners of the housing.

9. In a control device, a housing having a hollow interior, an electrode in each of the four sides of the housing energizable from a source of voltage to produce electrostatic fields, contacts within the interior of the device adjacent to each of said electrodes, conductors connected to each of said contacts to form circuits, a dielectric liquid within the interior of the housing, conducting particles suspended in said liquid, said particles being compacted to form a conducting path between a pair of contacts when the associated pair of electrodes are energized from a voltage source to have opposite polarity to charge and compact said particles and complete a circuit across opposite sides of the housing and/or diagonally across the corners thereof depending upon which electrodes are energized.

10. In a control device, a housing, electrodes in each end of the housing, pairs of contacts extending across opposite sides of the housing, dielectric fluid within said housing, conducting particles suspended in said dielectric fluid, said particles being compacted into a conducting path which bridges the contacts to complete a circuit when a voltage is applied to said electrodes for producing an electrostatic field, and a signal responsive switch in the voltage circuit for completing a circuit to the electrodes when a proper signal is received.

11. In a control device, a housing, a porous body within said housing, conducting particles in said porous body, electrodes in the walls of said housing, contacts adjacent to the paths between said electrodes, and switch means for connecting a voltage source to any number of said electrodes to apply an opposite polarity to at least a pair of said terminals for producing an electrostatic field which compacts the particles and produces a conducting path which bridges a pair of contacts to complete a circuit.

12. In a control device, a housing having a hollow interior, spaced contacts of a circuit within said housing, a dielectric fluid within the interior, graphite suspended within said fluid, and electrodes in said housing to which a voltage source is applied for producing an electrostatic field which compacts the graphite to thereby form conducting paths across a pair of contacts.

13. In a control device, a housing having a hollow interior, spaced contacts of a circuit within said housing, a dielectric fluid within the interior, graphite suspended within said fluid, and electrodes in said housing to which a voltage source is applied for producing an electrostatic field which compacts the graphite to thereby form conducting paths across a pair of contacts, the conductivity of said paths being increased by an increase in the voltage applied to the pair of terminals.

14. In a control device, a housing having a hollow in-

9

terior, spaced contacts of a circuit within said housing, a dielectric fluid within the interior, chargeable means suspended within said fluid, and electrodes in said housing to which a voltage source is applied for producing an electrostatic field which charges said means to thereby form a conducting path across said contacts.

15. In a control device, a housing, a porous body within said housing of dielectric material, particles adjacent to said body having greater dielectric properties, electrodes in the walls of said housing, and means providing a difference of potential across said electrodes for charging the dielectric particles and causing them to move into the pores of said body to increase the dielectric strength thereof.

16. In a control device, a housing having a hollow interior, spaced contacts of a circuit within said housing, a medium within said interior in which a change of state may occur, and electrode means in said housing to which a voltage source is applied for producing an electrostatic

10

field across said medium to effect a change therein and in the conductivity of the path across said contacts.

17. In a control device, a housing having a hollow interior, spaced contacts of a circuit within said housing, a medium within said interior in which a change of state may occur, and electrodes in said housing to which a voltage source is applied for producing an electrostatic field across said medium to effect a change therein and in the conductivity of the path across said contacts, the greater the difference in potential between said electrodes the greater the change in conductivity produced in said medium.

References Cited in the file of this patent

UNITED STATES PATENTS

2,660,640	Wolf	Nov. 24, 1953
2,687,500	Jones et al.	Aug. 24, 1954