Dec. 2, 1930. G. MERLE, SR 1,783,542

VOLTAGE CONTROLLING AND REGULATING DEVICE

Filed Aug. 24, 1928

Fig. 1,

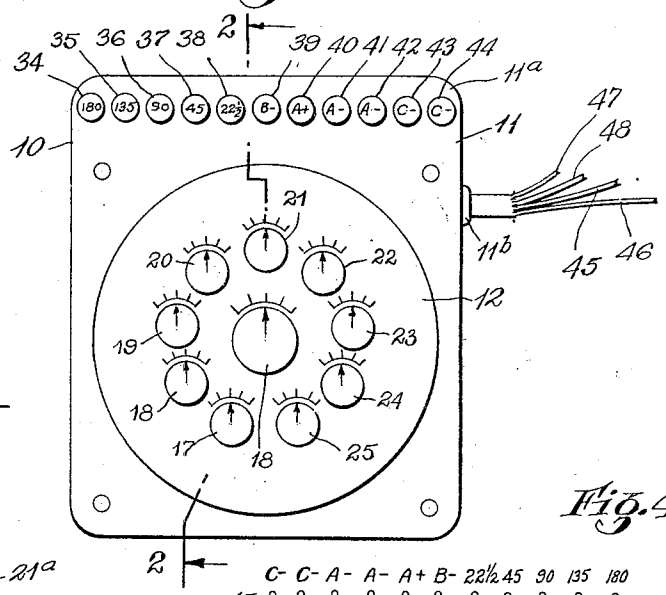


Fig. 2,

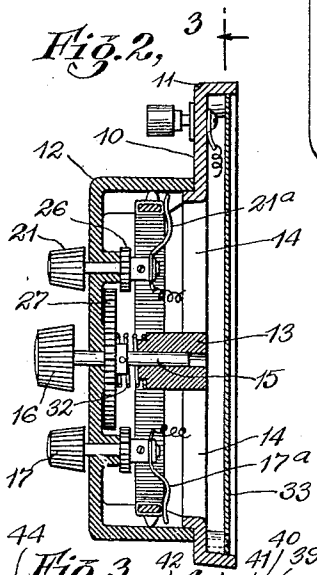


Fig. 3,

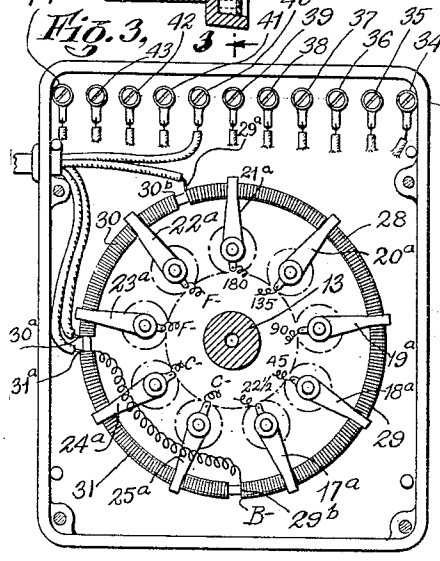


Fig. 4,

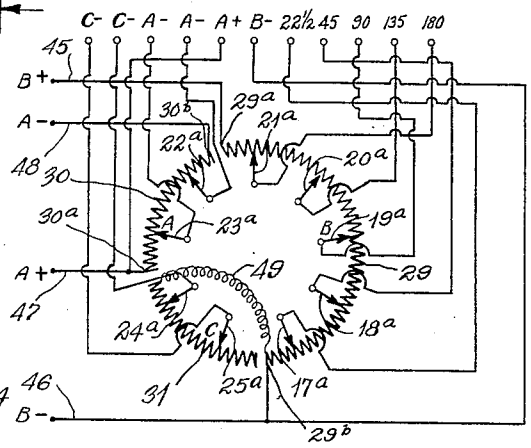
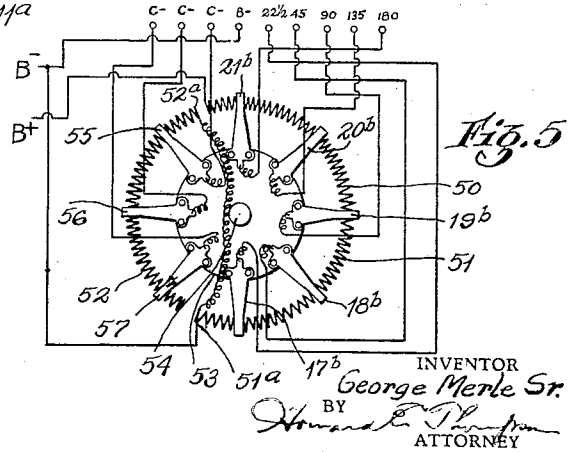


Fig. 5



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UNITED STATES PATENT OFFICE

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VOLTAGE CONTROLLING AND REGULATING DEVICE

Application filed August 24, 1923. Serial No. 301,866.

This invention relates to devices for controlling and regulating the voltage of electric currents and may be termed in this respect, a divider, whereby several electrical devices requiring differential current voltage supply may be electrically coupled with a single source of current supply; and the object of the invention is to provide a device of the class specified having independent means for adjusting or dividing the respective current supplies passed therethrough whereby the same may be modified or varied to suit the desired conditions, and further whereby all of the current dividing and regulating means may be collectively moved to advance or decrease the voltage supply to the several terminals leading from said device; a further object being to provide a device of the class specified wherein the voltage supply of two or more different characters may be divided and regulated in the collective and independent manner above stated, such for example, as an A current supply, a B current supply and C current supply, and especially when the device is adapted for use in connection with radio receiving circuits of various kinds and classes; a still further object being to provide a device of the class specified employing a resistance body in the form of a ring or annulus divided into two or more coils or windings, each coil or winding representing a circuit of predetermined characteristics, and further to the provision of spring contact members movable over the windings of the separate coils, collectively or independently; and with these and other objects in view, the invention consists in a device of the class and for the purpose specified which is simple in construction, efficient in use, and which is constructed as hereinafter described and claimed.

The invention is fully disclosed in the following specification, of which the accompanying drawing forms a part, in which the separate parts of my improvement are designated by suitable reference characters in each of the views, and in which:—

Fig. 1 is a plan view of one form of device which I employ.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a rear view of the device shown in Figs. 1 and 2, with part of the construction removed.

Fig. 4 is a diagrammatic view of the wire which I employ; and,

Fig. 5 is a view similar to Fig. 4 but showing a modification.

For the purpose of illustrating one use of my invention, I have shown in Figs. 1 to 4 inclusive, one form of construction, which as seen in Figs. 1 to 3 inclusive involves a casing 10, in which the mechanisms of my improved volt divider are arranged. The casing 10 consists of a substantially rectangular body 11, and a circular cup-shaped body 12 mounted on the outer face of the body 11. The body 11 carries a central bearing 13, by means of webs 14, the bearing 13 supporting the shaft 15 of the main operating knob 16 arranged on the outer face of the body 12. A plurality of smaller knobs 17, 18, 19, 20, 21, 22, 23, 24 and 25 are arranged circumferentially about the knob 16, and the shafts thereof extend through the front wall of the body 12 and are provided within said cup-shaped body with pinions 26, all of which are adapted to mesh with a gear 27 on the shaft 15.

Supported on the inner ends of the shafts of the several knobs 17 to 25 inclusive are spring contact members 17*a* to 25*a* inclusive, all of which are movable relatively to a resistance ring 28, which in the construction shown is divided into three resistance coils 29, 30 and 31.

A spring 32 is mounted upon the shaft 15 between one surface of the gear 27 and the bearing 13 and normally serves to hold said gear out of mesh with the several pinions 26. By pressing the knob 16 inwardly against the action of the spring 32, the gear 27 may be brought into mesh with all of the gears 26 to permit of the rotation or adjustment of all of the spring contacts 17*a* to 25*a* inclusive, it being also understood that when the gear 27 is in the position shown in Fig. 2 or out of engagement with the pinions 26, each of the spring contacts 17*a* to 25*a* may be independently adjusted upon the several resistance coils through the operation of the independent knobs 17 to 25 inclusive. A

cover or closure plate 33 is employed to seal the rear end of the device, and is mounted upon the rectangular body 11 as clearly seen in Fig. 2 of the drawing.

The body 12 is arranged closer to one end of the body 11 than the other to provide a terminal end portion 11*a* on which is supported a plurality of terminals or binding posts 34, 35, 36, 37, 38, 39, 40, 41, 42, 43 and 44 with which circuit wires leading to a predetermined apparatus may be coupled. Wires 45 and 46 from a source of electric supply extend into the body 11 through an insulated inlet 11*b*, said wires constituting a B voltage supply, whereas other wires 47 and 48 constituting an A voltage supply also pass through said inlet.

The wire 45 which will constitute the B positive voltage extends to one end 29*a* of the coil 29, whereas the wire 46 constituting the B negative voltage supply extends to the other end 29*b* of said coil. The last named end 29*b* of the coil 29 is joined with the end 31*a* of the coil 31 through a wire 49. The wire 47 which constitutes the A positive voltage supply extends to the end 30*a* of the coil 30 whereas the negative A voltage supply wire 48 extends to the end 30*b* of the coil 30.

A wire in circuit with each of the spring contacts 17*a* to 25*a* inclusive, is placed in circuit with a predetermined number of the terminals or binding posts 34 to 44 inclusive. To simplify this description and the needless application of reference characters, the following description is given of these circuit wires.

In the first place, the spring contacts 17*a* to 21*a* which control the division of the B voltage supply are in circuit with the terminals or binding posts 38, 37, 36, 35 and 34 respectively. In this connection, it is to be noted that the spring contact 17*a* controls the increase and decrease of the 22½ volt tap, the spring contact 18*a* the increase and decrease of the 45 volt tap, the contact 19*a* the 90 volt tap, the contact 20*a* the 135 volt tap, and the contact 21*a* the 180 volt tap, it being understood that a greater voltage than 180 volts may be attained by moving the contact 21*a* to the left as seen in Fig. 3 of the drawing up to the extreme end 29*a* of the coil 29. In like manner, each of the other contacts may be advanced to a materially greater voltage and proportionately reduced in voltage.

To guide the operator in the several voltage adjustments, each of the knobs 17 to 25 inclusive will have an indicating pointer cooperating with a segmental dial on the front face of the cup-shaped body 12, the knob 16 being also provided with an indicator and cooperating with a corresponding dial. In like manner, the spring contacts 22*a* and 23*a* are placed in circuit with the binding posts 41 and 42, the contact 22*a* controlling the A voltage up to 7 volts, and the contact 23*a* the A voltage from 7 to 15 volts. It will also be seen that the spring contact 24*a* connects with the terminal 43 and the contact 25*a* with the terminal 44, the former controlling the C voltage up to 15 volts and the contact 25*a* the C voltage up to 40 volts.

At this time, it may be well stated that the circuits leading to the several terminals control positive and negative voltages in the several circuits as follows. The terminals 34 to 38 inclusive control positive B voltage supply. The terminals 41 and 42 control negative A voltage supply and the terminals 43 and 44 negative C voltage. The terminal 39 is a negative B voltage terminal and connects with the end 29*b* of the coil 29 as seen, whereas the terminal 40 constitutes a positive A voltage terminal and connects with the end 30*a* of the coil 30. This completes the entire circuit of the device herein disclosed for illustrating one method of carrying my invention into effect.

The particular use of the device as disclosed is for the current supply to radio receiver circuits of various kinds and classes. It will be understood that the circuit wires from the receiver will be coupled with the several binding posts 34 to 44 inclusive in such manner as to supply the desired and required voltage in the A, B and C voltage supply to the several units or mechanisms of such radio receiving circuit.

The distinctive feature of my invention resides in the provision of a device wherein an annular resistance unit or ring is employed and made up of resistances for two or more independent or differential electric circuits with independent means for dividing and/or controlling the several voltage supplies to be transmitted from said circuit, and more particularly to the provision of a single controlling and regulating means, for example, the master knob 16, by means of which all of the several voltages leading from the device or the binding posts thereof may be proportionately increased or decreased. This can be accomplished with all of the knobs 17 to 25 inclusive and their spring contacts set at a neutral point or at an independently adjusted point. For example, the 180 B voltage supply which may be tapped from the terminal 34 may be set at an advanced voltage of 200 volts, the 135 volt tap designated at 35 at 130 volts, etc. throughout all of the independent adjustable controls in the several circuits employed.

It will therefore be seen that in the use of this device in connection with various electrical apparatus, such for example, as a radio receiving circuit, the voltage of the several tubes and other devices in the circuit may be controlled and regulated to

produce the most efficient and desirable reproduction and especially in the electrical action upon the plate, filament and grid of the vacuum tubes employed in circuits of this kind.

In Fig. 5 of the drawing, I have shown a slight modification wherein a resistance ring 50 is employed and is provided with two resistance coils 51 and 52. The coil 51 is similar to the coil 29 and has movably disposed with respect thereto spring contacts 17*b* to 21*b* similar to the contacts 17*a* to 21*a* except that the contacts 17*b* to 21*b* are mounted upon a common supporting ring 53 whereby all of said contacts are collectively advanced and retarded and the independent adjustment or advancement thereof is eliminated. In other words, with this construction, a single knob control similar to the knob 16 will be employed and the shaft with this knob is indicated at 54.

In the construction shown in Fig. 5, I also eliminate the A voltage supply and use the C voltage supply which is controlled and regulated through the coil 52 and three spring contacts 55, 56 and 57 are employed, the same being mounted upon and movable with the ring 53 in unison with the contacts 17*b* to 21*b* to advance and retard the C voltage supply. The end 51*a* of the coil 51 constitutes the negative B voltage and this end of the coil is joined with the end 52*a* of the coil 52 through a wire 58.

The construction diagrammatically illustrated in Fig. 5 also includes nine terminals or binding posts with which the wires to be directed to a suitable apparatus are employed as in the construction shown in Figs. 1 to 4 inclusive. Again, to simplify the drawing and to eliminate the use of needless references, these binding posts have been designated on the drawing from left to right by the following identifications, C40, C15, C7, all referring to the C voltage supply and constituting the negative side of the circuit; B— which is self-explanatory; 22½, 45, 90, 135 and 180 the several B positive voltage supplies, and all of these binding posts are respectively placed in circuit with the spring contacts 57, 56, 55, the end 51*a* of the coil 51, 17*b*, 18*b*, 19*b*, 20*b* and 21*b*.

The operation of the structure shown in Fig. 5 in the collective advancement and retarding of the B and C voltage circuits will be the same as the collective adjustment of the structure shown in the other figures, and while the separate spring contacts employed in Fig. 5 are not independently adjustable on the unit device, it will be understood that they may be adjusted as to relative positions upon the unit operating ring 53 to adapt the device to a specific use or in connection with a specific radio receiving apparatus in the manufacture thereof. When these relative adjustments have been made, the several voltage supplies may be collectively advanced and retarded in the same proportion.

The A voltage supply has not been included in the device diagrammatically illustrated in Fig. 5 of the drawing, to clearly express that my invention is not necessarily limited to the controlling of the voltages of all of these circuits as the same may be employed to control either one, a combination of any two, or a combination of all of these circuits may be employed in the device. It will also be apparent that my invention is not necessarily limited to the use of the independent and collective adjustment of the several voltage controlling elements as the collective adjustment only may be employed.

It must also be apparent that my invention is by no means limited to the specific use in connection with radio receiving circuits herein disclosed as the device may be employed for modifying voltages of electric circuits of any kind or class and for electric supply to devices, mechanisms, appliances or circuits of any kind or class, regardless of the amount of voltage or the nature of the current employed. Various other changes in and modifications of the construction herein shown and described may be made within the scope of the appended claims without departing from the spirit of my invention or sacrificing its advantages.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A multiple circuit voltage divider of the class described comprising a casing, a plurality of shafts spaced circumferentially of the casing, spring contact devices supported on the inner ends of said shafts, knobs on the exterior of said shafts by means of which said devices may be actuated, a resistance body supported in the casing and in the path of said contact devices, said body being divided into a plurality of resistance units in connection with which said contact devices operate, said contact devices being independently adjustable through the operation of said knobs, pinions on said shafts within the casing, another shaft arranged centrally with respect to the first named shafts and provided with a gear adapted to mesh with the pinions on the first named shafts, and means externally of the casing for rotating said shaft to collectively operate all of said contact devices.

2. A multiple circuit voltage divider of the class described comprising a casing, a plurality of shafts spaced circumferentially of the casing, spring contact devices supported on the inner ends of said shafts, knobs on the exterior of said shafts by means of which said devices may be actuated, a resistance body supported in the casing and in the path of said contact devices, said body being divided into a plurality of resistance units

in connection with which said contact devices operate, said contact devices being independently adjustable through the operation of said knobs, pinions on said shafts within the casing, another shaft arranged centrally with respect to the first named shafts and provided with a gear adapted to mesh with the pinions on the first named shafts, and means externally of the casing for rotating said shaft to collectively operate all of said contact devices, and means for normally holding said gear out of engagement with said pinions.

3. An electric circuit volt divider of the class described comprising an annular resistance body in circuit with a source of electric supply, said body being divided into distinct voltage units, a plurality of electric contacts movably disposed with reference to each unit of said resistance body and in contact therewith, each of said contacts controlling a predetermined voltage output through the respective units, said contacts including knobs by means of which the same may be actuated over said resistance body to increase and decrease the voltage output therethrough and permitting independent adjustment of the separate contacts and a single control arranged to engage and actuate all of said contacts collectively.

4. An electric circuit volt divider of the class described comprising an annular resistance body in circuit with a source of electric supply, said body being divided into distinct voltage units, a plurality of electric contacts movably disposed with reference to each unit of said resistance body and in contact therewith, each of said devices controlling a predetermined voltage output through the respective units, said contacts including knobs by means of which the same may be actuated over said resistance body to increase and decrease the voltage output therethrough and permitting independent adjustment of the separate contacts and a single control arranged to engage and actuate all of said contacts collectively, and means for normally supporting said control in inoperative position.

5. A multiple circuit voltage divider of the class described comprising a plurality of resistance coils arranged in a circumferential path, a plurality of circumferentially arranged and spaced shafts within the boundaries of said resistance coils, contact arms on each of said shafts and arranged over and adapted to slidably engage said coils, means for placing said coils and contact arms in predetermined circuits, knobs on said shafts whereby the same may be rotated to independently actuate said contacts to increase or decrease the voltage output therethrough, another shaft arranged centrally of said first named shafts, and means on the last named shaft and the first named shafts whereby the rotation of the last named shaft will collectively rotate all of the first named shafts.

6. An electric circuit volt divider of the class described, comprising an annular resistance body in circuit with a source of electric supply, said body being divided into distinct voltage units, a plurality of electric contacts movably disposed with reference to each unit of said resistance body and in contact therewith, said contacts being mounted on independent pivots arranged and spaced circumferentially with respect to said annular resistance body, each of said contacts controlling a predetermined voltage output through the respective units, and means on the pivot of each contact whereby the same may be independently actuated.

In testimony that I claim the foregoing as my invention I have signed my name this 20th day of August, 1928.

GEORGE MERLE, SR.