Aug. 30, 1949. C. H. BURNELL 2,480,218

RHEOSTAT

Filed Feb. 2, 1945

Fig. 1

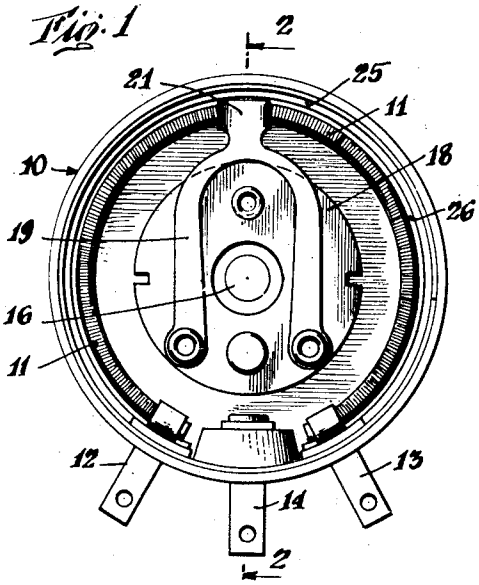


Fig. 2

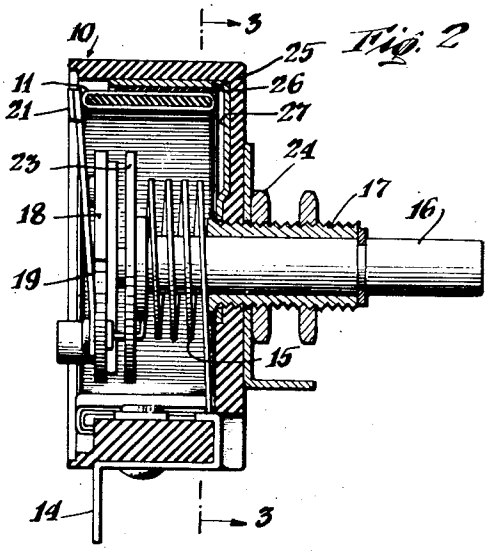


Fig. 3

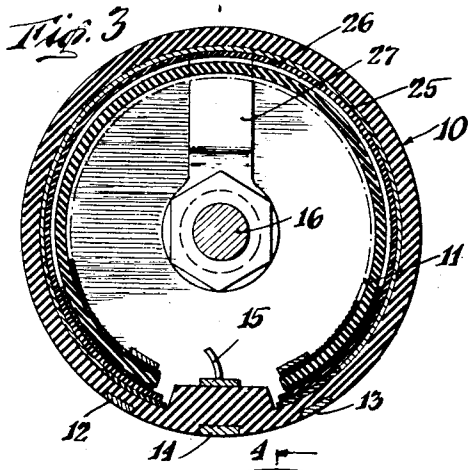


Fig. 4

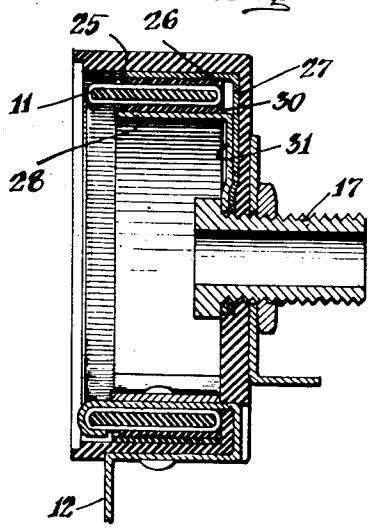
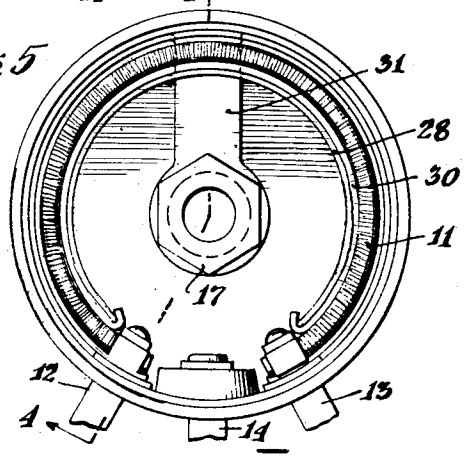


Fig. 5



INVENTOR.
Charles H. Burnell
BY
Duell, Kane & Smoot
ATTORNEYS

Patented Aug. 30, 1949 2,480,218

UNITED STATES PATENT OFFICE

2,480,218

RHEOSTAT

Charles H. Burnell, Northport, N. Y., assignor to Clarostat Mfg. Co., Inc., Brooklyn, N. Y., a corporation of New York

Application February 2, 1945, Serial No 575,906

8 Claims. (Cl. 201—56)

1

This invention relates to a structurally and functionally improved control and in its more specific aspects aims to provide a unit such as a rheostat, potentiometer or similar electrical instrument which will be more efficient and desirable than in units of this type as heretofore constructed.

It is a well appreciated fact that in rheostats and potentiometers, as well as similar instruments, considerable difficulty has been experienced incident to the development of relatively high temperatures which have been maintained for protracted periods of time. Such conditions have often resulted in the distortion and impairment of parts of the instrument and particularly the coil thereof. Especially where critical circuits are involved, the impairments have resulted in changes of values such that faulty and undesirable results have been obtained. At best, when such conditions have prevailed, it has been necessary to replace the defective part. Aside from the expense involved in this connection, the entire apparatus of which the part of unit forms a portion is rendered inoperative during such period of replacement. Additionally, it frequently becomes necessary after such replacement to correlate or tune the other instrument involved in the circuit, thus further adding to the expense and period of inoperativeness of the assembly.

With the foregoing in mind, it is a primary object of the invention to provide a control structure in which the incidental heat developed is rapidly dissipated. Accordingly, the temperature will not build up to a critical point and therefore the parts of the assembly and particularly the coil will not be damaged due to high temperatures.

A further object is that of furnishing a structure of this nature and in which a supporting construction will be provided serving to prevent distortion or other damage to the coil. Thus, even if the latter is subjected to shock or high temperatures, the likelihood of damage will be reduced to a minimum.

Still another object is that of furnishing a control embodying a design by means of which the foregoing objects may be achieved and which control will include relatively few and rugged parts, such parts being capable of quantity production and assembly and so that a unit may be produced at a relatively nominal figure and which will have a long life during which it will operate with freedom from all difficulties.

With these and other objects in mind, reference is had to the attached sheet of drawings illustrating practical embodiments of the invention, and in which:

2

Fig. 1 is a face view of a control;

Fig. 2 is a sectional side view taken along the lines 2—2 and in the direction of the arrows as indicated in Fig. 1;

Fig. 3 is a transverse sectional view taken along the lines 3—3 and in the direction of the arrows as indicated in Fig. 2.

Fig. 4 is a view similar to Fig. 2 but showing certain of the parts removed and, moreover, illustrating an alternative form of structure taken along the lines 4—4 and in the direction of the arrows as indicated in Fig. 5; and

Fig. 5 is a face view of the unit as shown in Fig. 4.

In these views, the reference numeral 10 indicates a body preferably formed of di-electric material and within which an arcuate coil is housed. This coil—indicated by the numeral 11—may have its ends coupled to terminals 12 and 13. The latter extend beyond the body 10 as does also a terminal 14. This terminal, as especially shown in Fig. 2, is connected to a coiled member 15 of conducting material.

A rotatable shaft 16 may extend through a bushing 17 mounted by the body 10. This shaft, adjacent its inner end, may support a rotor 18 again preferably formed of dielectric material. A metallic member 19 may be fixed against movement with respect to the rotor 18 and have its arms connected to the end of the coil 15. This member may, moreover, be provided with a contact arm 21 to engage the convolutions of the coil 11. The arm 21 preferably embodies somewhat resilient characteristics. A disc 23 is mounted on shaft 16 within the body 10 and limits the inward movement of the shaft. An outward movement of the body 18 and shaft is prevented by conveniently affixing a nut 24 to the bushing 17.

As may well be understood, the foregoing traverses generally one type of instrument and one particular design of that type. This structure is to be regarded in an illustrative rather than in a limiting sense in that it will be obvious that not alone may the following teachings be applied to instruments of various types but also the latter may embody one of numerous different designs.

Generally with an instrument of this character, the terminals 12 and 13 are connected to proper electrical leads. The same is true of the terminal 14. When the shaft is rotated by means of a knob or other suitable actuating member

(not shown), the rotor 18 will be similarly rotated. This will cause the arm or its equivalent to be turned. With such movement, the coil 15 will become more constricted, or will have its convolution increase in diameter. It follows that current will be free to flow through the circuit defined by the extension or arm 21, the convolutions of the coil 11, and terminals 12, 13 and 14. According to the position to which the rotor has been adjusted, a different value or balance will be established as may be desired by the operator.

Now in order to dissipate undesired heat from the structure of the instrument and as a consequence of the flow of current through the parts thereof, it will be observed, as shown in Figs. 1, 2 and 3, that a strip of metal 25 having high heat-conductivity may be interposed between the body 10 and the coil 11. Conveniently, a spacing strip 26 of dielectric material may in turn be interposed between the ring 25 and the coil. By radiation and conduction, the heat generated within the convolutions of the latter will be transmitted in large measure to the ring 25. It will be conducted by the extension 27 of the latter to the bushing 17. From this bushing, it will be transmitted to the shaft 16. Consequently, a relatively large heat-dissipating or radiating surface is furnished, such that the heat generated will be rapidly drawn off. Therefore, it will be found that the parts of the coil will never reach a critical temperature and, therefore, the coil will not become distorted or damaged as a result of high temperatures.

In Figs. 4 and 5, a structure generally corresponding to that illustrated in the preceding figures has been shown. Additionally, however, a further ring 28 is arranged adjacent the inner face of the coil 11. A further piece or strip 30 corresponding to the strip 26 may be interposed between the coil and the ring 28. Due to the fact that the latter ring is formed with an extension 31 corresponding to the extension 27 and also in contact with the bushing, it follows that ring 28 or its equivalent will act in conjunction with ring 25 to conduct and dissipate the heat away from the coil. As illustrated, both the strips 26 and 30 may be of materially less width than the width of the rings 25 and 28 to allow of a maximum air flow and radiation between the coil and these rings. Therefore, it is apparent that in this form of structure an even greater dissipation of heat will occur than in the form illustrated in Figs. 1 and 3.

The structure shown in Figs. 4 and 5 has the further advantage that the ring 28 or its equivalent may have a spring or expansive action. Thus, it will bear against the inner surfaces of the convolutions of the coil 11. This will have the effect of rigidifying the latter, further guarding against distortion of the coil parts. This effect will be beneficial not alone to the inner faces of the convolutions but also the outer faces thereof. In other words, those portions of the coil which lie adjacent the ring or strip 25 will likewise be rigidified. This will be because the expansive action of the strip or ring 28 will force the coil outwardly into firm supporting contact with the parts disposed adjacent the same. Therefore, even if the instrument is subjected to relatively critical temperatures which are maintained for long periods of time and during which it might be subjected to jars and shocks, it is unlikely that damage will result.

From the foregoing, it will be appreciated that, among others, the several objects of the invention as specifically afore noted are achieved. Obviously, numerous changes in construction and rearrangements of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. A control including in combination a resistance element which, incident to the conducting of current, generates heat, a contact cooperable with said element, a metallic shaft connected to said contact to cause the same to traverse said element, a housing of dielectric material enclosing said element and with a portion of its body substantially parallel thereto, a metallic strip separate from said housing and element, interposed between the same and electrically spaced from the element, and an extension connection to said strip and shaft, said extension lying substantially in contact with the housing face and beyond said element to conduct heat generated by the latter from said strip to said shaft.

2. A control including in combination a resistance element which, incident to the conducting of current, generates heat, a contact cooperable with said element, a metallic shaft connected to said contact to cause the same to traverse said element, a housing of dielectric material enclosing said element and with a portion of its body substantially parallel thereto, a metallic strip separate from said housing and element, interposed between the same and electrically spaced from the element, a second metallic strip enclosed by said element and extensions connected to said strips and shaft, said extensions lying substantially in contact with each other and the housing face to conduct heat generated by the element from said strips to said shaft.

3. A control including in combination a resistance element which, incident to the conducting of current, generates heat, a contact cooperable with said element, a metallic shaft connected to said contact to cause the same to traverse said element, a housing of dielectric material enclosing said element and with a portion of its body substantially parallel thereto, a metallic strip separate from said housing and element, interposed betwen the same and electrically spaced from the element, said element and strip being disposed substantially parallel to each other with the outer edge of said element extending beyond the adjacent edge of said strip, and an extension connected to said strip and shaft, said extension lying substantially in contact with the housing face and beyond said element to conduct heat generated by the latter from said strip to said shaft.

4. A control including in combination a resistance element which, incident to the conducting of current, generates heat, a contact cooperable with said element, a metallic shaft connected to said contact to cause the same to traverse said element, a housing of dielectric material enclosing said element and with a portion of its body substantially parallel thereto, a metallic strip separate from said housing and element, interposed between the same and electrically spaced from the element, a bushing encircling said shaft and supporting the same with respect to said housing and an extension connected to said strip and bushing, said extension lying substantially in contact with the housing face and beyond said element to conduct heat generated by the latter from said strip to said shaft.

5. In a variable resistance instrument, a dielectric housing, a resistance element within the

housing, a heat conductor disposed exteriorly and adjacent to, but electrically insulated from said element and having a central extension, a heat-conducting bushing for attaching the instrument to a metallic chassis or the like and intimately engaging said extension for facilitating heat transfer from the heat conductor to the chassis.

6. In a variable resistor, a dielectric housing, a resistance element disposed therein; a heat conductive member substantially coextensive with said resistance element and disposed in electrically insulated, but closely spaced relationship to said element whereby to absorb heat generated by said element; a second heat conductive member communicating with the interior of said dielectric housing and affording means for securing said housing to a supporting structure; a heat conductor extending between and secured to said respective heat conductive members for conducting heat from said first member directly to said second member and thence to the supporting structure; a contact disposed within said housing to traverse said resistance element; a shaft extending through said second named heat conductive member and supporting said contact for such traversal; and an electricity conductor electrically connecting said contact to a circuit externally of said housing.

7. In a variable resistor, a dielectric housing, a resistance element therein, a heat conductive member closely surrounding but insulated from said element, said heat conductive member being adapted to quickly absorb heat from said element, a wiper contact adapted to ride over said element, a shaft for actuating said contact, means for insulating said shaft from said contact, a thermally conductive bushing serving for attaching the housing to a heat conductive chassis and for journaling said shaft, a heat conductive connection intimately associating said heat conductive member with said bushing, a terminal for said wiper contact on said housing, and a spiral spring element electrically connecting said terminal with said wiper contact.

8. In a variable resistor, a dielectric support, a resistance element carried thereby, an insulated terminal secured to said support, a wiper contact operative over the element, an operating shaft for said wiper contact and being insulated therefrom, a heat conductive bushing serving as a journal for said shaft and for attaching the support to a heat conductive chassis, a spiral spring element electrically connecting said wiper contact with said terminal, and heat dissipating means intimately associated with but being electrically insulated from said resistance element and being heat conductively connected with said bushing for transferring heat from the element to the bushing and thence to the chassis for dissipation by the latter.

CHARLES H. BURNELL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,266,188	Foley et al.	Dec. 16, 1941

FOREIGN PATENTS

Number	Country	Date
11,937	Great Britain	July 11, 1913