Feb. 15, 1927. 1,618,014

F. W. KAISLING

RHEOSTAT

Filed April 3, 1924

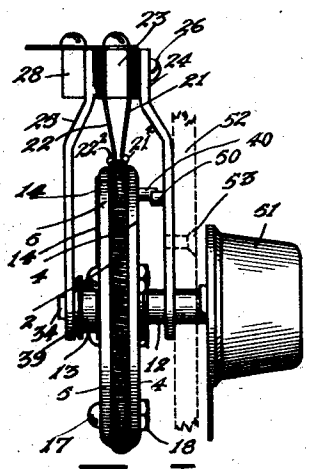

Fig. 1.

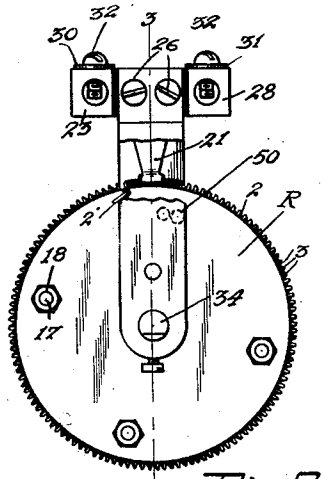

Fig. 2.

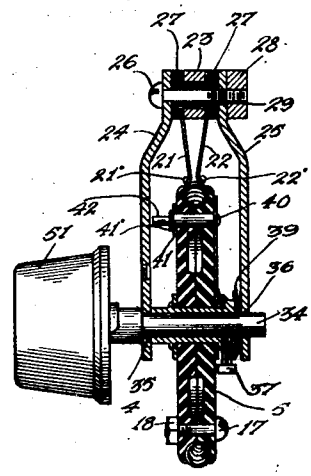

Fig. 3.

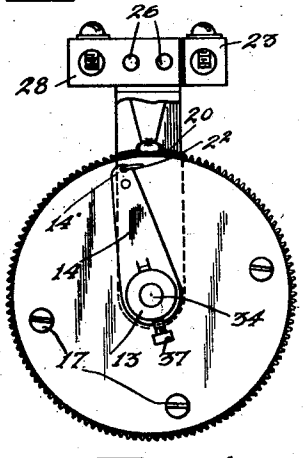

Fig. 4.

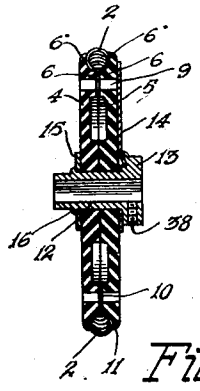

Fig. 5.

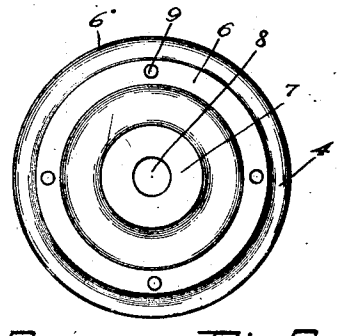

Fig. 6.

Inventor:
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By Attorney.

Patented Feb. 15, 1927. 1,618,014

UNITED STATES PATENT OFFICE.

FRANK WILLIAM KAISLING, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

RHEOSTAT.

Application filed April 3, 1924. Serial No. 703,926.

My invention relates to rheostats used in connection with an electric circuit for varying the resistance therein and more particularly for use in controlling the current flow through the filament of an audion or electron tube; and an object of my invention is to provide a rheostat which is simple in construction and operation but very durable and efficient.

A feature of my invention is the provision of an improved helically wound resistance unit supported between a pair of disk members which when clamped together secure the resistance unit in position against movement relative to the disks, the disks and resistance unit as a whole forming a compact and efficient rotatable unit.

Another feature of my invention is the utilization of one of the means, I employ for securing the pair of disk members of my rotatable unit together, as stop means for limiting the amount of rotation of said rotatable unit in its mounted position.

A further feature of my invention is the provision of a pair of spring contact wipers which have their free ends so formed and shaped that they correspond to the contour of my resistance element and are adapted to engage and insure positive contactual engagement therewith.

Still another feature of my invention is the provision of an insulation member for separating the ends of the resistance element of my invention and the manner in which the said insulation member is secured in place to separate the ends of said resistance element.

The above features, as well as others, will be more particularly pointed out in the ensuing specification and for a more complete understanding of the rheostat of my invention reference may be had to the accompanying drawing in which like reference characters, in the several views denote like parts, and in which;

Fig. 1 is a side view of the rheostat of my invention;

Fig. 2 is a front plan view of the rheostat of my invention showing a part thereof removed to expose one of the spring contact wipers;

Fig. 3 is a sectional view along the line 3—3 of Fig. 2;

Fig. 4 is a back plan view of my invention with certain parts removed;

Fig. 5 is a sectional view of the rotatable resistance carrying unit of my invention taken along the line of its equator; and

Fig. 6 is a plan view of one of the disk members of the rotatable unit of my invention.

Referring now more in detail to my invention as illustrated in the accompanying drawing, the rheostat of my invention comprises a helically wound resistance unit 2 of a plurality of convolutions 3, constructed of suitable resistance material and of a predetermined resistance. The rotatable unit R which supports the resistance unit 2 comprises a pair of disks 4 and 5 moulded of suitable insulation material such as bakelite. As the disks 4 and 5 are identical in construction a description of one will suffice. In one face of each of the disks and integrally formed therewith is a raised portion 6 near the periphery and in the shape of a ring. The outer peripheral edge 6′ of the ring 6 is arcuate shaped and adapted to form a channel for receiving and engaging the convolutions 3 of the resistance element 2 as will be pointed out more in detail later. A hub member 7 is provided in the center of each of the disks 4 and 5 and integrally formed therewith, said hub member 7 being of a size slightly thicker than the thickness of the ring portion 6 for purposes hereinafter described. An orifice 8 is provided in each disk 4 and 5 as is also a plurality of orifices 9.

Having described the construction of the disks 4 and 5 I will now describe how the rotatable unit R is assembled and the resistance element secured therein. The two disks 4 and 5 are placed together in matched relation so that the faces of the hub members 7 engage each other and the faces of the

ring portions 6 are opposite each other, the faces of the ring portions 6 do not engage each other but are slightly separated by an air gap 10 due to the thickness of the hub members 7 which prevent the engagement of the ring portions 6. At the same time the disks 4 and 5 are being placed together the resistance element will engage the circumferential channel 11 formed between the disks 4 and 5 by the ring portions 6 and the peripheral edges of said disks. The channel 11 formed by the disks 4 and 5 and by the ring shaped portions 6 of said disks is of such a size that the peripheral edges of the disks 4 and 5 extend slightly above the center or diameter of the convolutions 3 of the resistance element 2 whereby a uniform top portion of each convolution 3 is exposed and adapted to be engaged by contact wipers 21 and 22. To secure the disks 4 and 5 together a sleeve member 12 is provided which has a collar 13 integrally formed therewith and is adapted to extend through an opening in a conducting member 14 and then to pass through the openings 8 in the disks 4 and 5 and then through a washer 15 where it has a shoulder portion 16 upset to prevent its removal wereby the disks 4 and 5 are secured together, the washer 15 engaging one of the disks, while the collar 13 and conducting member 14 engage the other of said disks. To securely clamp the resistance element 2 between the disks 4 and 5, screws 17 are provided which extend through the openings 9 provided in the disks 4 and 5 and then have screw-threaded engagement with nuts 18. The nuts are screwed down on the screws 17 to cause the ring portions 6 of the disks 4 and 5 to come together and close the air gap 10 whereby the resistance element 2 is securely clamped in the channel 11 against displacement. The screws 17 and nuts 18 bring the ring portions 6 together which will reduce the size of the channel 11 and clamp the resistance element 2 between said disk members 4 and 5 to form the rotatable unit R. One end 2′ of the resistance element extends through a suitable opening in disk 4 and is then turned over to prevent its removal, while the other end 2^2 of said resistance element 2 extends through a suitable opening in the disk 5 and an orifice 14′ in the conducting member 14 and is then bent over to connect the end of the resistance element 2 with the sleeve 12 which is in turn conductively connected to the terminal 30. To separate the ends of the resistance element 2 a piece of insulation 20 corresponding in shape to the contour of the channel 11 is provided which engages and separates the respective ends of said resistance element 2 and is clamped in the channel 11 between the disks 4 and 5 in the same manner as described in connection with the resistance element 2. The insulation member 20 has a uniform portion of its body exposed out of the channel 1 and above the periphery of the disks 4 and 5 which exposed portion corresponds in size and contour to the exposed portion of the convolution 3 and is adapted to be engaged by the ends 21′ and 22 when my rheostat is in its off normal position in which position the resistance element 2 will not be included in the operating circuit. The screws 17 by engaging the aligned orifices 9 secure and clamp the disks 4 and 5 together to prevent turning of one disk relative to the other on the sleeve 12, and also clamp the resistance element 2 and insulation member 20 in the channel 11 formed by the disks 4 and 5 which has been placed therein during the assembly of the disks 4 and 5 as has already been described.

The spring contact wipers 21 and 22 are provided for engaging the helical resistance element 2 and are separated by means of a suitable terminal block 23. A pair of mounting legs 24 and 25 are provided between which the terminal block 23 and wipers 21 and 22 are clamped by means of suitable clamping screws 26. The terminal block 23 and wipers 21 and 22 are suitably insulated from the mounting legs 24 and 25 by means of suitable insulation strips 27 and the clamping screws 26 which pass through suitable orifices in the mounting legs 24 and 25, terminal block 23, wipers 21 and 22, and insulation strips 27 have screw threaded engagement with suitably tapped orifices in a terminal block 28 and are insulated from the terminal block 23 and wipers 21 and 22 by insulation bushings 29. Suitable terminals 30 and 31 are secured to the terminal blocks 23 and 28 by means of screws 32. The free ends 21′ and 22′ of the wipers 21 and 22 are bent over and so formed that they correspond to the contour of the exposed portion of the resistance element 2 which extends slightly above the circumferential edges of the disks 4 and 5 due to the position of the ring 6 which renders the channel 11 shallow enough to cause a uniform portion of each convolution of the resistance element 2 to extend above the disks 4 and 5 as has just been described. The free ends 21′ and 22′ of wipers 21 and 22 are adapted to make contact with several of the convolutions 3 of the resistance element 2 at the same time and are of such spring tension that good contactual engagement is insured at all times. The portions 21^2 and 22^2 of the ends 21′ and 22′ respectively are flared slightly outward to permit free rotation of said resistance element 2 between the bent over ends 21′ and 22′ of the wipers 21 and 22.

The unit R and its supported parts as a whole are rotatably supported between the

legs 24 and 25 and to position and rotatably support the same, the unit R is inserted between legs 24 and 25 with the insulating member 20 resting between the ends 21′ and 22′ of wipers 21 and 22. A shaft 34 is now inserted through an orifice 35 in the leg 24 and through the central orifice in the sleeve 12 and through the orifice 36 in the leg 25, and a set screw 37 having screw-threaded engagement with the tapped orifice 38 in the collar 13 of the sleeve 12 is provided and adapted to have its end engage the shaft 34 to secure the unit R as a whole to the shaft 34 so that when the actuating knob 51 which is secured to the end of the shaft 34 in any suitable manner is turned the shaft 34 which rotates in the bearings 35 and 36 in the legs 24 and 25 and its support unit R rotate as a whole to place the convolutions 3 of the resistance element 2 in engagement with the wiper ends 21′ and 22′ to include a certain amount of resistance in the operating circuit in which my rheostat is being used and when the rotatable unit R is rotated back to its normal position the insulation separator 20 will again engage the wiper ends 21′ and 22′.

When the rotatable unit R is rotated and the resistance element 2 passes between and engages the ends 21′ and 22′ of contact wipers 21 and 22, the convolutions 3 are maintained uniformly spaced and in their correct position by the clamping effect of the disks 4 and 5 by the screws 17 and nuts 18, so that there is no creeping of the resistance element 2 in the channel 11.

The set screw 37 prevents removal of the shaft 34 and to maintain the rotatable unit R in any of its adjusted positions I provide a dished or spring washer 39 which when inserted between the end of the sleeve 12 or collar 13 and the inner face of the leg 25 produces a frictional effect between the end of the sleeve 11 or collar 13 and the leg 25 to hold the rotatable unit R in any of its adjusted positions. I provide a stop pin 40 which extends through a washer 41 and then through suitable aligned openings in the disks 4 and 5 and member 14 and then has its end staked over to prevent its being removed from the rotatable unit R, the collar 41′ engaging the washer 41. The stop pin 40 takes the place of a screw 17 and nut 18 and assists to clamp the disks 4 and 5 together to cause ring portion 6 to engage each other, and also to maintain the conducting member 14 in place. The stop pin 40 is adapted to engage a suitable stop pin 50 secured to the leg 24 in the path of travel of the end 42 of the stop pin 41 to limit the rotation of the unit R in its "off" and extreme "on" positions.

To mount my rheostat the actuating knob 51 may be removed and the end of the shaft 34 inserted through a suitable opening in a suitable mounting member 52 and to secure the rheostat to the member 52 a screw 53 is provided which extends through a suitable opening in the member 52 and has screw-threaded engagement with a suitably tapped orifice in the leg 24.

While I have described a preferred embodiment of my invention it is to be understood that I do not wish to be limited to the exact structure as shown and described but intend to cover all changes and modifications as come within the spirit and scope of the appended claims.

What I claim as new and desire to secure by United States Letters Patent, is as follows:

1. A device of the class described including a resistance element, a pair of disk members, each provided with an integrally formed hub member and an integrally formed ring body portion near its periphery, the hub member being of a greater thickness than the thickness of said ring body portion, means for clamping said pair of disk members together in matched relation so that said ring body portions form a channel for receiving said resistance element, said ring body portions being slightly separated due to the thickness of said hub members, and means for engaging said disk members for bringing said ring body portions together to clamp said resistance element in position between said disk members.

2. A device of the class described including a helically formed resistance element, a pair of disk members, a ring integrally formed with each of said disk members near the periphery of the disk member, another ring for each of said disk members, and of a greater thickness than the thickness of said first ring, means for securing said disk members together in matched relation, said first rings forming a channel between said pair of disk members for receiving said resistance element, said first rings forming said channel being separated due to the thickness of said other rings and being positioned to cause said resistance element to extend slightly above the periphery of said disk members, and means for clamping said first rings together to clamp said resistance element in said channel against displacement.

3. A device of the class described including a resistance element, a pair of disk members adapted to be clamped together, a pair of ring body portions integrally formed with the inner faces and near the periphery of said clamped disk members to form a channel for receiving said resistance element, other ring body portions for said pair of disk members for separating said first ring body portions, and means for clamping said

first ring body portions together to securely clamp said resistance element in said channel against displacement, said channel being of a depth to allow said resistance element to be exposed above the periphery of said disk members.

4. A device of the class described including a resistance element, a pair of disk members secured together, ring body portions integrally formed with said disk members to form a channel for receiving said resistance element, hub members integrally formed with said disk members and adapted to provide an air gap between said ring body portions to render said channel of sufficient size to permit the adjustment of said resistance element in said channel, and means for engaging said disk members for closing said air gap to securely clamp said resistance element in said channel.

5. A device of the class described including a helically formed resistance element, a pair of disk members secured together, means integrally formed with and between said disk members to provide a channel for receiving said resistance element, means integrally formed with and between said disk members to render said channel of a size slightly larger than the diameter of said resistance element, and means for engaging said disk members for reducing said channel to a size smaller than the diameter of said resistance element to clamp said resistance element in said channel against displacement, said resistance element and said pair of disk members forming a single operating unit.

6. A device of the class described including a resistance element comprising a plurality of convolutions, a pair of disk members secured together and having integrally formed hub members adapted to separate integrally formed ring body portions located near the peripheral edge of said disk and arranged to form a circumferential channel between said disk members of a size to receive said resistance element, and means for engaging said disk members for reducing the size of said channel to a size smaller than the diameter of the convolutions of said resistance element to securely clamp said resistance element in said channel against displacement, said channel being of such depth to cause a uniform portion of said convolutions to extend above the peripheral edge of said disk members.

7. A device of the class described including a mounting frame, a resistance element comprising a plurality of convolutions, a pair of disk members secured together and arranged to form a circumferential channel for receiving said resistance element, means for clamping said resistance element in said channel to form a single unit, a portion of each of said convolutions being exposed above the periphery of said disk members, means for rotatably supporting said unit on said frame, and a pair of spring contact wipers secured to said frame and having their free ends turned slightly over and arcuate shaped to conform to the contour of the convolutions of the resistance element and adapted to engage and permit the said exposed portions of said convolutions to pass between said turned over arcuate shaped ends of said wipers.

8. A device of the class described including a mounting frame, a resistance element comprising a plurality of convolutions, a pair of disk members secured together and constructed to form a circumferential channel for receiving said resistance element, said channel being of such size that a portion of each of said convolutions extends out of said channel and above the periphery of said disk members, means for clamping said resistance element in said channel to form a unit, means for rotatably supporting said unit on said mounting frame, a spring contact wiper secured at its one end to said mounting frame and having its other end bent over and shaped to conform to the contour of the exposed portion of said convolutions, the corners of said bent over end being flared up so that when said unit is rotated said other end will ride over the convolutions of said resistance element and insure contactual engagement therewith.

9. A device of the character described including a resistance element, a pair of disk members provided with integrally formed ring shaped ridges, hub members for said disk members, means for securing said disk members together so that said hub members engage each other end to end, said ring shaped ridges being positioned opposite each other but not in contactual engagement and adapted to form a circumferential channel for receiving said resistance element, and means for effecting contactual engagement of said ring shaped ridges to reduce the size of said channel to clamp said resistance element in said channel against displacement.

10. A device of the class described including a resistance element, a mounting frame, a pair of disk members provided with integrally formed ring shaped ridges adapted to form a groove for receiving said resistance element when said disk members are secured together, said ring shaped ridges disengaging each other to permit the adjustment of said resistance element in said grooves, means including a pin for engaging said disk members to cause said ridges to engage each other whereby said resistance element is clamped in said groove between said disk members to form a rotatable unit, a shaft for rotatably supporting said unit on said mounting frame, and a stop pin se-

cured to said mounting frame and adapted to be engaged by said first pin to limit the extent of rotation of said rotatable unit.

11. A device of the class described including a mounting frame, a pair of disk members secured together and having their inner faces provided with a pair of integrally formed hub members adapted to engage each other to separate a pair of integrally formed ring body portions to form a circumferential channel, means for securing said disk members together, but allowing the said channel to be of a size sufficient to permit the insertion of a resistance element adapted to fit into said channel, a pin extending through said disk members and adapted to engage said disk members to reduce the said channel to clamp said resistance element in said channel against displacement to form a rotatable unit, a rotatable shaft for rotatably supporting said rotatable unit on said mounting frame, and a stop pin secured to said frame and adapted to be engaged by said first pin to limit the amount of rotation of said rotatable unit.

12. A device of the class described including a resistance element comprising a plurality of convolutions, a pair of disk members adapted to be secured together, said disk members having integrally formed hub members on their inner faces, said hub members adapted to engage each other to separate integrally formed ring members of said disk members to form a circumferential channel for receiving said resistance element, an insulation member corresponding to the contour of said channel and adapted to fit into said channel and to engage and separate the ends of said resistance element, and means for clamping said disk members together to clamp said resistance element and said insulation member in said channel against displacement.

13. A device of the class described including a resistance element comprising a plurality of convolutions, a pair of disk members provided with ridge body portions near their peripheral edge and with integrally formed hub members on their inner faces, said disks adapted to be secured together, the hub members engaging each other to separate the ring body portions to form a circumferential channel for receiving said resistance element, an insulation member corresponding to the contour of said channel adapted to fit into said channel and to engage and separate the ends of said resistance element, means for reducing said channel to clamp said resistance element and said insulation member in said channel against displacement, said channel being of a size to permit a uniform portion of said convolutions and said insulation member to be exposed above the periphery of said disk members, and a pair of spring contact wipers adapted to engage the exposed portion of said insulation member when said device is in its off normal position and to engage the exposed portion of certain of said convolutions when said device is in its on position.

14. A device of the class described, including a resistance element, a pair of members secured together and provided with means, including a pair of integrally formed hub members adapted to engage each other to separate a pair of integrally formed ring body portions located near the peripheral edge of said members to provide a circumferential channel between said members for receiving said resistance element, an insulation member shaped to fit into said channel and adapted to engage and separate the ends of said resistance element, and means for reducing said channel to clamp said resistance element and said insulation members in said channel against movement to form a single unit with said disk members.

15. A device of the class described including a pair of disks having integrally formed hub members on their inner faces adapted to separate a pair of integrally formed ring body portions to form a channel in the peripheral edge of said disks for receiving a resistance element and partially encompassing the same, means permitting the reduction in size of said channel when the said disks are clamped together to clamp said resistance element in said channel against movement, and a cylindrical member of insulating material separating the ends of said wire and adapted to fit into said channel.

16. A device of the class described including a pair of disks having integrally formed hub members on their inner faces adapted to separate a pair of integrally formed ring body portions to form a channel in the peripheral edge of said disks for receiving a resistance element, said channel partially encompassing said resistance element to permit a uniform portion of said convolutions to be exposed above the periphery of said disks, means integral with said disks for reducing said channel when the said disks are clamped together to secure said resistance element in said formed channel against movement, and a cylindrical member of insulating material separating the ends of said wire and adapted to fit into said channel.

17. A device of the class described including a mounting frame, a pair of disks having integrally formed hub members and integrally formed ring body portions adapted to form a groove in the peripheral edge of each of said disks, said grooves forming

a channel when said disks are in matched relation, said hub members engaging each other to separate the edges of the disks to permit the insertion of a resistance element in said channel, said resistance element partially encompassed by said disks to permit a uniform portion of the convolutions of said element to protrude above the peripheral edge of said disks, other grooves in said disks forming other channels, means for clamping said element in said formed channel to form a unit, means for rotatably supporting said unit on said frame, and a wiper secured to said frame for engaging the exposed portion of said convolutions.

Signed by me at Chicago, in the county of Cook and State of Illinois, this 1st day of April, 1924.

FRANK WILLIAM KAISLING.