

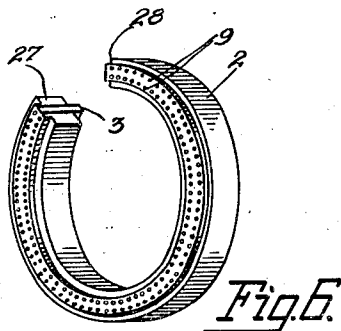
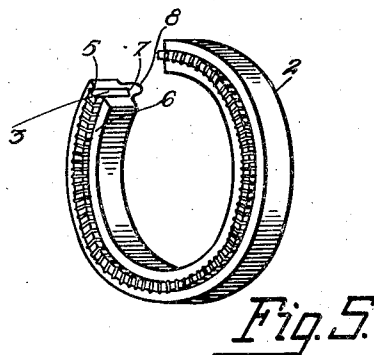
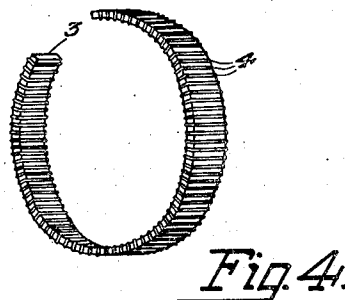
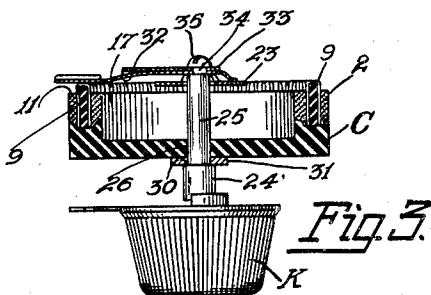
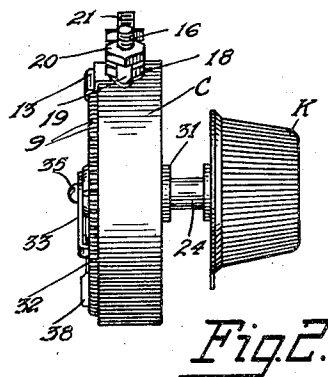
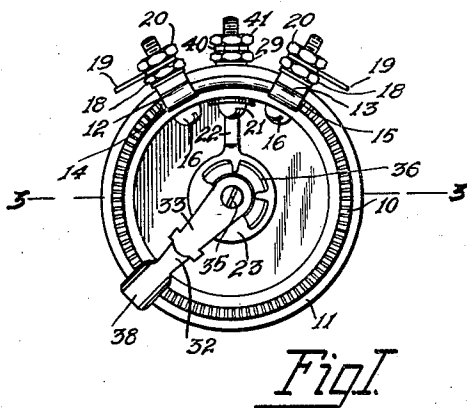
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J. L. HOWIE

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VARIABLE RESISTANCE

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UNITED STATES PATENT OFFICE

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VARIABLE RESISTANCE

Application filed December 17, 1926. Serial No. 155,357.

My invention relates to electrical resistance devices and more particularly to a variable resistance unit, and an object of my invention is to provide a simple and inexpensive variable resistance unit which is positive in its operation and can be constructed to cover a very wide range of resistances.

A feature of my invention is the provision of a new and improved resistance element in combination with a suitable insert which makes contact with the body of the resistance element.

Another feature of my invention is the provision of a suitable supporting member which is made integral with the resistance element by means of a suitable moulding operation and the provision of a wiper rotatably supported by said member for engaging the insert for varying the amount of resistance in a circuit.

The above features as well as others not specifically pointed out will be more fully hereinafter outlined, and for a more complete understanding 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 rear view of the variable resistance unit of my invention,

Fig. 2 is a right side view of Fig. 1,

Fig. 3 is a sectional view along the line 3-3 of Fig. 1,

Fig. 4 is a perspective view of the fibre split ring insert which supports a helix of conducting material,

Fig. 5 is a perspective view of the resistance element of the variable resistance with the fibre split ring and its supported helix embedded in the formed resistance element, and

Fig. 6 is a perspective view of the resistance element in its final form in which the convolutions of the helix partially embedded in the element are severed by a suitable operation to form individual loops.

Referring now more in detail to my invention as illustrated in the accompanying drawings, the variable resistance of my invention comprises a split ring shaped resistance element 2 of suitable conducting material. The

element 2 is composed of a mixture of binder material, such as a phenol compound, which is preferably a non-conductor and a finely divided conducting material such as graphite. The insulating and graphite materials are thoroughly mixed and deposited in a suitable mold and a fibre split ring 3 supporting a helix 4 of suitable wire is also placed therein, and the mixture is then subjected to heat and pressure to cause the mixture to harden. The fibre split ring 3 and supported helix 4 are partially embedded in the formed split ring shaped resistance element 2 as clearly illustrated in Fig. 5. The edge 5 of the split ring shaped fibre 3 and is supported helix 4 project slightly from the face 6 of the element 2 and the other edge 7 of the fibre split ring 3 and the remaining portion of the helix 4 are embedded in the body of the element 2 but in proximity to the opposite face 8. Sufficient material is removed from this face 8 by means of a suitable grinding operation to sever the individual convolutions of the helix 4 which convolutions after being severed form a series of individual loops 9 are clearly illustrated in Figs. 3 and 6 and these individual loops 9 make permanent and unvarying contact with the conducting material of the resistance element 2.

The unit comprising the ring 3 and helix 4 and the resistance element 2 is next placed in a suitable mold containing a suitable non-conducting compound, and by means of heat and pressure the phenol compound is hardened to fuse with the resistance element 2 and the ring 3 and helix 4 to form a cup shaped member C, with the projecting edge 5 of the fibre split ring 3 and exposed portions of the loops 9 forming an annular ring 10 on the rim 11 of the cup member C, whereby the resistance element 2 and the helix 4 and its supporting ring 3 and the phenol compound form a single unitary structure. Conducting plates 12 and 13 are provided and contact with the exposed portions of the loops 9 at the respective ends 14 and 15 of the fibre split ring 3 partially embedded in the element 2. Screw 16 passing through suitable orifices in the wall 17 of the member C and plate members 12 and 13 receive nuts 18

to maintain the plates 12 and 13 positioned in engagement with the loops 9 as just described. Terminals 19 are secured to the screws 16 by suitable nuts 20 and these terminals 19 receive the external circuit connections of the circuit with which the variable resistance operates.

A terminal screw 21 passes through an arm 22 which terminates at its opposite end in a circular plate 23 which is provided with a central orifice of a size to fit loosely the reduced portion 25 of a shaft 24 which extends through a central orifice 26 in the member C. The screw 21 passes through a suitable orifice in the wall 17 which is formed between the gap of the respective ends 27 and 28 of the resistance element 2 when the same is fused to form the cup shaped member C. The screw 21 passed through this insulating portion of the wall 17 and a nut 29 having threaded engagement with the screw 21 secures the arm 22 and its integrally formed plate 23 in position.

The reduced portion 25 of the shaft 24 which extends through the orifice 26 in the cup member C forms a shoulder 30 which rests against a washer 31 and prevents inward longitudinal movement of the shaft 24. A wiper 32 and a follower arm 33 are secured to the end 34 of the reduced portion 25 of the shaft 24 by a suitable screw 35 which has threaded engagement with a tapped orifice in the end of the shaft 24. The wiper 32 is provided with an integrally formed split dished portion 36 which engages the circular plate 23 associated with the arm 22 which is formed so as to produce a spring effect and force the plate 23 in contactual engagement with the dished portion 36 of the wiper 32, and provides frictional means for holding the wiper 32 in any of its adjusted positions, as will be presently described.

The wiper 32 is provided with an enlarged end portion 38 which is adapted to engage the respective exposed portions of the loops 9 and this end of the wiper 38 is formed to provide a spring effect for gripping the loops 9 to assure a good contactual engagement between the wiper end 38 and the loops 9. The arm 22 which is integrally formed with the plate 23 electrically connects the terminal 40, secured to the screw 21 by a nut 41, with the wiper 32 so the same may be connected with an external circuit. A knob K attached to the end of the shaft 24 by suitable means rotates the shaft 24 and carries the end 38 of the wiper 32 over the loops 9 of the element 2 and through the agency of the loops 9 which are embedded in the resistance material of the element 2 the resistance of a circuit with which the variable resistance of my invention may be associated may be changed between any desired limits depending upon the density of the resistance element and the proportion of the graphite.

Having described a specific form of my invention, I do not wish to be limited to the exact structure illustrated and described, but aim to cover all changes and modifications as come within the scope of the appended claims.

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

1. A variable resistance of the character described including a molded split ring conductive element, a non-conducting material fused with said conductive element to form a cup-shaped element, metallic loop members partially embedded in said member, said conductive element, said loop members and said non-conducting material forming a unitary structure, a rotatable shaft supported by said unitary structure and a terminal secured to said unitary structure, a conducting member having one end secured to said terminal and its other end enlarged to form a disk, a movable contact arm supported by said shaft and having an enlarged end comprising a plurality of depending members engaging said disk, said other end of said contact arm being in contact with said loop members.

2. A variable resistance of the character described comprising a molded split ring conductive element, a nonconducting material fused with said conductive element to form a cup shaped member, metallic loop members partially embedded in said element, and a conducting member having an enlarged end, a contact arm having an enlarged end comprising a plurality of depending legs engaging said enlarged end of said conducting member for maintaining said contact arm in position, said contact arm being movable in contact with said loop members.

3. A device of the character described comprising a split ring supporting a helix of wire partially embedded in a molded ring of conductive material forming a resistance element, the convolutions of the embedded helix being severed to form individual loops which make permanent contact with the conductive material, a phenol condensation product fused with said resistance element to form a unitary cup shaped member, a terminal supported by said cup shaped member, a conducting member having one end secured to said terminal and its other end formed into a disk, and a movable contact arm adapted to contact with the loops of wire and having an enlarged end comprising a plurality of depending legs engaging said disk to maintain said contact arm in its adjusted position.

4. In a device of the character described comprising a split ring supporting a helix of wire, a mixture of conducting material and phenol condensite material, said conducting and phenol type material and said ring and supporting helix being molded to form a unitary cup shaped member and to partially embed said ring and supporting helix in

the molded split ring resistance element, the convolutions of the embedded helix being severed to form individual loops which contact with the conductive material of said resistance element, a terminal member, a conducting member secured at one of its ends to said terminal and having its other end shaped into a disk, and a contact arm having one of its ends adapted to move over said loops and its other end comprising a plurality of depending legs adapted to engage said disk to secure said wiper in its adjusted position.

5. In a device of the character described comprising a split ring supporting a helix of wire partially embedded in a molded ring conductive material forming a resistance element, the convolutions of the embedded helix being severed on one surface of said molded split ring resistance element to form individual loops, a phenol type material and said resistance element and said helix being fused to form a unitary cup shaped member with said exposed portion of said split ring and its supporting loops forming an annular ring on the rim of said cup shaped member, a terminal member, a conducting member secured at one of its ends to said terminal and having its other end shaped into a disk, and a contact arm having one of its ends adapted to move over said loops and its other end comprising a plurality of depending legs adapted to engage said disk to secure said wiper in its adjusted position.

6. A device of the character described comprising a split ring supporting a helix of wire partially embedded in a molded split ring conductive material forming a resistance element, the convolutions of the embedded helix on one surface of said molded split ring resistance element being severed to form individual loops, a phenol type material and said resistance element being fused to form a unitary cup shaped member with said exposed portion of said split ring and its supporting loops forming an annular ring on the rim of said cup shaped member, and a wiper arm rotatably supported by said cup shaped member movable in contact with said exposed loops.

7. A device including a resistance member provided with conducting contacts molded therein, a phenol condensation product fused with said resistance member and said contacts to form a unitary cup-shaped supporting member, and a contact member having one end composed of a plurality of depending legs adapted to engage associated mechanism for maintaining said contact member in its adjusted positions, said contact member for variably engaging said contacts to variably change the effective resistance.

8. A device including a contact, a resistance member having contacts of conducting material molded therein, a phenol condensa-

tion product fused with said resistance member to form a unitary cup shaped supporting member, and a movable contact member having one end composed of a plurality of depending legs adapted to engage associated mechanism for maintaining said contact member in its adjusted positions, said contact member for variably engaging said contacts for changing the effective resistance between said first contact and said movable contact.

Signed by me in the city of Chicago, county of Cook and State of Illinois, this 14th day of December, 1926.

JOHN L. HOWIE.