Dec. 1, 1925.

1,564,157

L. WAINWRIGHT

VARIABLE GRID LEAK

Filed April 26, 1924

Fig. 1

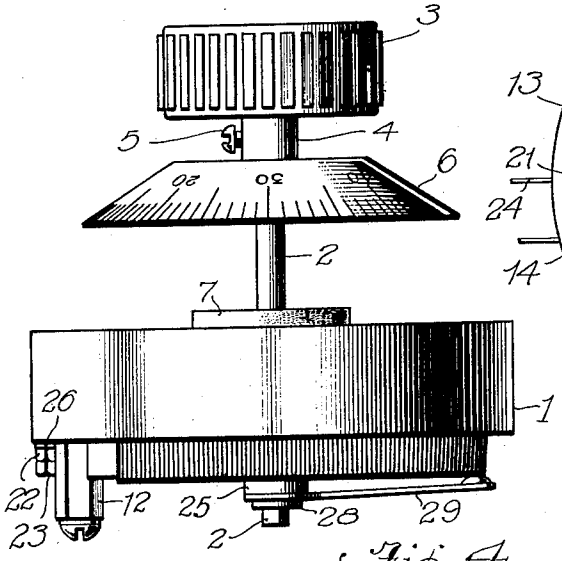


Fig. 2

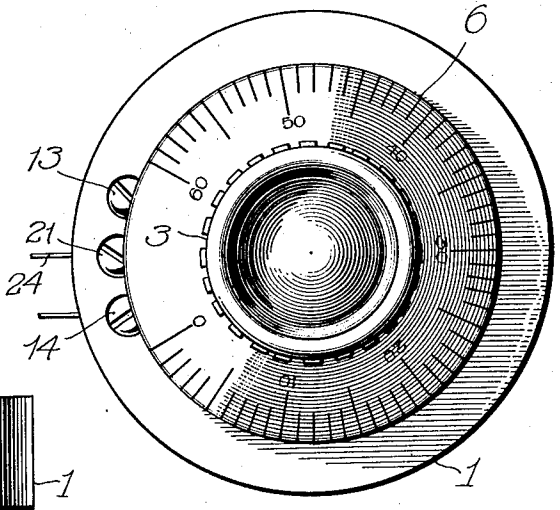


Fig. 3

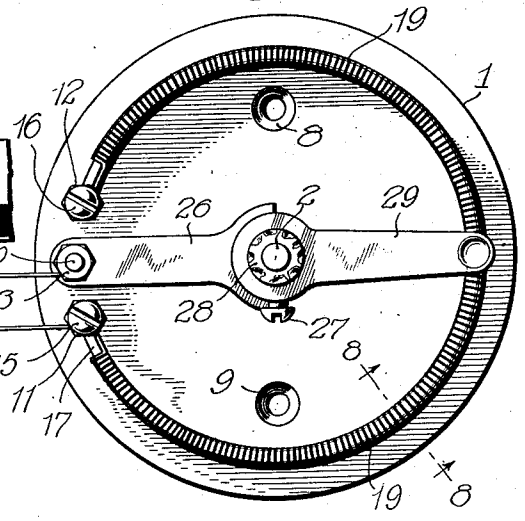


Fig. 4

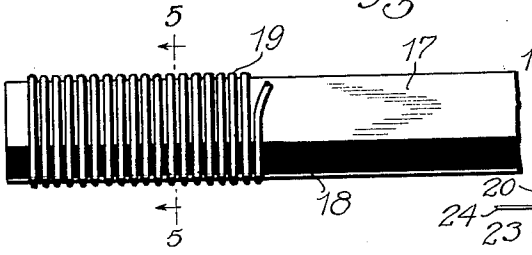


Fig. 5

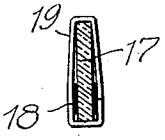


Fig. 6

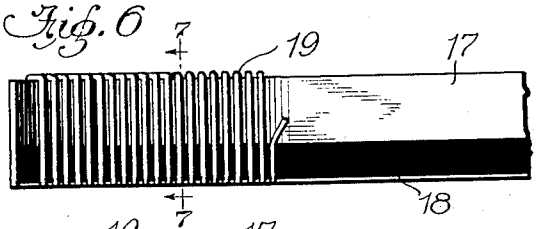


Fig. 7

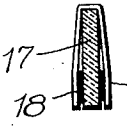
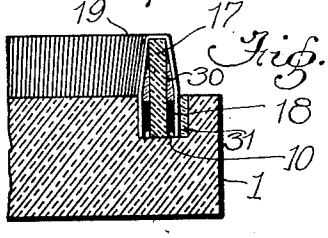


Fig. 8



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UNITED STATES PATENT OFFICE.

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VARIABLE GRID LEAK.

Application filed April 26, 1924. Serial No. 709,185.

To all whom it may concern:

Be it known that I, LAWRENCE WAINWRIGHT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Variable Grid Leaks, of which the following is a specification.

In radio telegraph and telephone, sound amplifying, picture transmitting and related electrical devices, it is often desirable to have a high resistance of low current carrying capacity for use as a grid leak, or potentiometer.

The present invention relates to such a resistance for use as a grid leak in this class of devices, and particularly in radio telephone sets.

An object of the present invention is to provide a high resistance of low current carrying capacity for use as a grid leak which will not be subject to erratic variations, but will be effectively and continuously variable.

Another object of the invention is to provide such a device with a high resistance coating which will not subject the device to easy derangement by becoming polished in use and thereby failing to make efficient and proper contact with a movable wiper.

Another object of the invention is to provide a device of this class in which the resistance of the coating will not be subject to variation by the absorption of atmospheric moisture.

Another object of the invention is to provide such a device whose resistance medium is not a liquid, and, consequently, one which can be used with equally good results in any position.

Further objects are to provide a device of the character stated which will have a wide range of variation, and a high resistance coating which will not be flaked or rubbed off, or polished, by wiping contact.

Still further objects are to provide a device of this character which shall be compact in form, relatively simple in construction, inexpensive to manufacture and efficient in use.

A further object of the invention is to provide a method of constructing a device which will have the advantages stated.

Other objects and advantages of the invention will appear from the following description, taken in connection with the accompanying drawings, which illustrate one preferred embodiment of the invention, and in which:

Fig. 1 is a side elevation of a device embodying the present invention;

Fig. 2 is a top plan view thereof;

Fig. 3 is a bottom view;

Fig. 4 is a fragmentary side elevation of the high resistance medium at one state of its construction;

Fig. 5 is a transverse section, taken on the line 5—5 of Fig. 4;

Fig. 6 is a fragmentary side elevation of the high resistance medium in a more advanced stage of its construction;

Fig. 7 is a transverse section, taken on the line 7—7 of Fig. 6; and

Fig. 8 is a fragmentary sectional elevation of the insulating block with the high resistance medium assembled therein.

Referring in detail to the drawings, in which like reference numerals indicate like parts throughout, the numeral 1 indicates an insulating block, which is herein represented, by way of example, as being in the form of a thick circular disc, though the precise form of this block is not material to the present invention.

A central opening extends axially through the block 1 for the reception of a pin 2, which is adapted to rotate in said opening, and has attached to it at one end a knob or other suitable means 3 by which it may be rotated. The knob 3 may be provided with the collar 4, to receive the end of the pin 2, to which said collar may be clamped by the set screw 5 extending radially through said collar.

A conical indicating disc 6 may be non-rotatably secured to the pin 2, and may be assembled on said pin to abut the end of the collar 4, against which it may be clamped by a suitable lock nut on its under side, not shown. The indicating disc 6 may be graduated to scale about its periphery, as indicated, and said scale may be read with respect to some fixed mark, for example, on an instrument board upon which the device may be mounted. It will be understood that the knob 3 and indicating disc 6 will be located upon the observer's side of the instrument board, while the insulating block 1 and the parts carried by it may be located on the opposite side.

A washer 7 of insulating material may be placed on the pin 2 against the lock nut or other means which clamps the indicating disc 6 in place, and may be of such thickness as to extend partly beyond the disc 6 on the pin 2 on the observer's side of the instrument board, for the purpose of preventing the disc 6 from actually contacting with said board, though allowing its close proximity thereto.

The insulating block 1 may be provided with holes 8 and 9 extending therethrough, by which it may be clamped by bolts or other suitable securing means to an instrument board.

The block 1 may be provided on its under side with an annular groove 10, which is illustrated as extending nearly completely around said block, and at the ends of said groove are located binding posts 11 and 12, which are internally screw threaded for the reception, at one end, of clamping screws 13 and 14, respectively, by which said binding posts are secured to the insulating block 1. The heads of the clamping screws 13 and 14 may be countersunk in the block 1, to insure a smooth surface contact of said block with one side of an instrument board. At their other ends, said binding posts are adapted to receive binding screws 15 and 16, respectively.

The groove 10 is designed to contain the high resistance medium constituting more particularly the present invention, and which will now be described.

A flat strip 17 of fiber or other suitable insulating material, preferably flexible, is provided with a strip or coating 18 of high resistance medium, such, for example, as india ink, or other substance having, preferably, as in india ink, a high carbon content. The strip 17 is then spirally wound with wire or other suitable conducting material, preferably of high resistance, such, for example, as German silver wire. The windings or coils preferably lie flat against and in close contact with the insulating strip 17 and the high resistance coating 18 thereon. The windings lie close together, but the coils are sufficiently spaced from each other so that there will not be electrical contact between adjacent coils. As an additional precaution against possible electrical contact between two adjacent coils, insulating material may be applied with a brush between the turns. Figs. 4 and 5 illustrate the appearance of the resistance medium at that stage of its construction in which the coils or turns of wire extend continuously around the strip 17. The above mentioned insulating material may, as will be understood, be applied at any stage of the construction of the device.

In order to prevent any current from passing from one coil or turn of wire to the next through the wire itself, a portion of each coil or turn is removed, and, where the device is to be used in a circular block, as in the example of the invention herein illustrated, such removal is preferably accomplished in the following manner.

The wound strip 17 (Figs. 4 and 5) is bent to circular form, held firmly in this position with the turns of wire tightly in contact with the high resistance coating, and, while the strip 17 is in this position, the portions of the coils which overlie one edge of the strip are planed or filed off or otherwise removed, giving the strip the appearance illustrated in Figs. 6 and 7. While the portions of the coils or turns are being removed, the strip may be held firmly around a cylindrical block, or may be held in any suitable clamp. Or, instead of providing a groove 10 in the insulating holding block 1 to receive the wound strip 17, said block need not be provided with a groove, in which case the strip 17 may be curved about its outer cylindrical surface and clamped there permanently by one or more clamping rings, leaving both edges of the strip projecting beyond the clamping or insulating holding block 1. After one of the edges of the strip has been planed or filed off or otherwise removed, a cap of insulating material may be screwed over the bottom of the holding block and clamping rings, or may be otherwise secured thereover.

Where the strip has been held in a separate clamp or holder for the removal of portions of the turns, it may be removed therefrom when this has been accomplished and may now be inserted in the groove 10, care being taken that the broken turns or coils remain in electrical contact with the high resistance coating, and, if desired, a clamping or wedging ring 31 of insulating material may be inserted in the groove 10 beside the strip 17 for the purpose, in addition to other means which may be used, of holding the strip in the groove, and also for the purpose of holding the broken turns of wire in firm electrical contact with the high resistance coating.

To prevent possible changes in the resistance of the coating 18 caused by absorption of atmospheric or other moisture, after the assembly of the strip in the insulating holding block 1, the sides of the strip, including the spaces between the turns of wire, are preferably coated with wax or other similar material 30, which preferably completely covers the high resistance coating, and may completely fill the remaining space in the groove 10 not already occupied.

As each turn or coil is now separated from its adjacent turn or coil by the removal of a portion, and as each is also spaced from its adjacent turn or coil and insulated therefrom, it is now impossible for a current to

pass from one broken turn of wire to the next without passing through the high resistance strip or coating 18.

In the form of the invention herein illustrated, one edge of the strip with its overlying turns of wire comprises a substantially horse-shoe shaped series 19 of contact points, formed by the exposed ends of the separated coils. The end turns, that is, those adjacent the binding posts 11 and 12, are connected to said binding posts at the bottoms thereof.

A screw threaded binding post 20 extends through the insulating holding block 1, and is provided at one end with a screw head 21, which may be countersunk in the block 1. At its other end the binding post 20 may be provided with securing nuts 22 and 23, by which it may be clamped to the block 1, and by which one of the wires 24 of the grid shunt in which the device may be used may be connected to said binding post. The other wire of the shunt may be connected to either one of the binding posts 11 or 12.

On the under side of the block 1, the pin 2 may be provided with a collar 25, and a spring connecting link 26 may connect the binding post 20 with said collar. The collar 25 may be non-rotatably secured to the pin 2 by the set screw 27. At its outer end with respect to the block 1 the collar 25 may have a portion 28 of reduced diameter, whose peripheral surface may be roughened for the purpose of non-rotatably securing thereon with a driving fit a spring wiper 29, to rotate with said collar and with the pin 2.

The spring wiper 29 extends outwardly from the pin 2 in a radial direction, and its outer edge overlies and is adapted to move across the series of contact points or edge 19 of the high resistance medium.

The spring wiper 29, being fixed to the pin 2 through the collar 25, will rotate with said pin when the knob 3 is turned, and the graduated disc 6, also moving with said pin, will indicate, with reference to a fixed mark, the relative position of said spring wiper on the periphery of the edge 19.

It will be apparent from the foregoing that current may pass into the device through one of the binding posts 11 or 12, then through one turn of the end broken coil to the high resistance coating 18, thence through said high resistance coating to the turn or coil which at the moment is under and in contact with the movable wiper, thence through said turn or coil to said movable wiper, through the latter, the collar 25 and spring link 26 to the binding post 20, and from this point through a suitable conductor to the other side of the grid; or the current may flow through the device in the opposite direction. While two high resistance coatings or strips 18 are shown, it will be understood that only one, or any number, may be used.

It will be seen that by the construction herein described, there has been provided a high resistance of low current carrying capacity especially suitable for use as a grid leak in radio telegraph and telephone, sound amplifying, picture transmitting and related electrical devices, which is effectively and continuously variable, and in which the high resistance coating cannot become polished, rubbed or flaked off and will not absorb moisture, and, consequently, one whose efficiency will remain constant in use.

What is claimed is:

1. The method of constructing a high resistance which comprises coating an insulating strip with a high resistance medium, winding said insulating member with a conductor, and removing those portions of said windings of said conductor overlying one edge of said strip.

2. A grid leak comprising a strip of insulating material having thereon a high resistance coating, a conductor wound about said insulating strip, the turns of said conductor being in contact with said high resistance coating, and said turns being separated from each other by the removal of that portion of each turn which overlies one edge of said strip.

In testimony whereof I affix my signature.

LAWRENCE WAINWRIGHT.