Dec. 28, 1937. E. SEVERIN ET AL 2,103,873

VARIABLE RESISTOR DEVICE

Filed April 22, 1936

Fig. 1

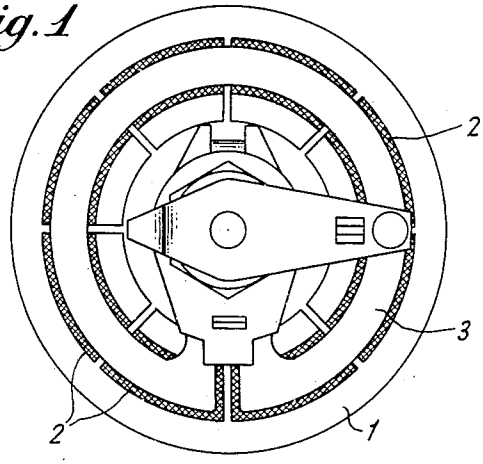


Fig. 2

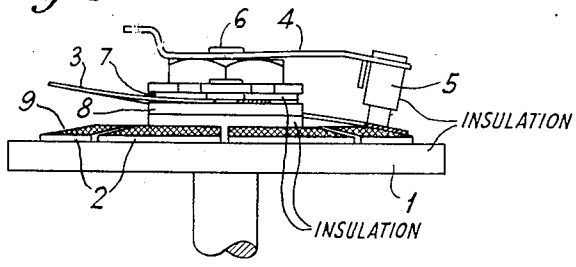
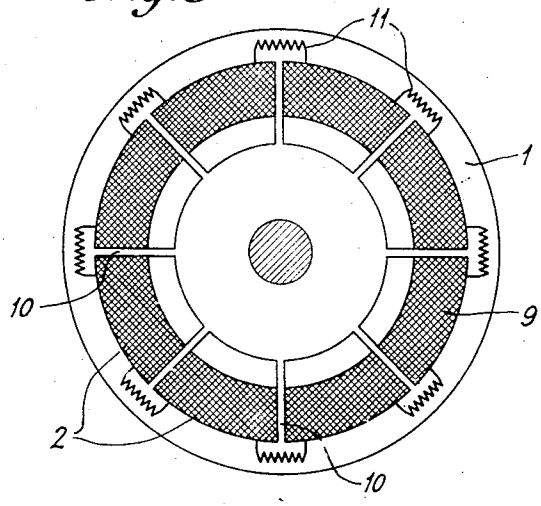


Fig. 3



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VARIABLE RESISTOR DEVICE

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4 Claims. (Cl. 201—48)

The invention relates to a variable resistor characterized by the novel design of the elements establishing the contact. The novel resistor is used with preference in apparatus for wireless communication.

The known variable resistors in which the tapping of the current is not carried out across non-gliding contact members such as yielding contact members with rolling movement, have the disadvantage that between the resistor and the contact rolling thereon, dust particles may easily be deposited and which when operating the voltage divider will be pressed down upon the surface of the resistor or upon the contact where they cause an interruption between contact and the resistor.

Similar conditions exist in voltage dividers in which special contacts are provided between resistor and take-off contact. In the known structures, these contact members consist of wires embedded at certain distances in the carbon resistor and fixedly joined therewith. The free ends of the wires are bent around a separate supporting body. The take-off contact, ordinarily a tumbler disk of conducting metal, glides in a rolling movement in the known manner on the surface of these wire ends in this way establishing the connection between the take-off contact and the resistor.

Since the surface of each wire piece making contact with the take-off contact is comparatively large, also in this case dust particles deposited on the surface of the wire produce a disturbing effect.

If the wire becomes oxidized there likewise occurs an interruption of the contact between the take-off member and the resistor. Even where the take-off contact at the respective place of tapping is under a high pressure, the specific pressure on the wire is low owing to the comparatively large surface, and this prevents the splitting of the oxide layer deposited on the wire surface. Hence, complete interruption between the cooperating contact occurs.

To eliminate the disadvantages of these known resistors, in acordance with the invention, the surface of the contacts connected to the resistor and making direct galvanic connection during operation with the take-off tumbler disk, or in case of elongated resistors, a band-shaped, elastic element, are totally or partially roughened or provided with grooving. It is hereby accomplished that at the rolling movement of the take-off contact on the counter contacts practically taking place without friction, dirt particles deposited between said organs are pressed into the grooves of the counter contacts. As tests have shown, even when a considerable amount of dirt settles on the contact surface, the voltage divided still operates without objection, since the dirt particles at operation of the voltage divider glide from the projections into the grooves or they are pressed thereinto, so that the projections are always in continuous contact with the metal of the take-off contact.

Neither does oxidation of the contact surface cause an interruption, since the oxide layer will be destroyed during the switching performance. This is due to the fact that owing to the grooving of the contact surface, the specific pressure upon the individual surface parts of the counter contacts becomes so high that the oxide layer eventually formed will again be torn apart. Hence, a favorable passing of current between take-off contact and counter contact will always be assured.

The new type of resistors was found to be especially advantageous in resistors with radially arranged contacts and in which, as take-off contact, a so-called tumbler disk is used.

Between the comparatively large counter contacts, special resistors can be interposed in the form of fixed single resistors, and which are not influenced by atmospheric conditions. Thus the hitherto customary carbon resistors with open surface, which proved to be very unreliable in operation, are omitted.

Variable resistors having fixed resistance stages are already known. In these resistors the take-off contacts were formed as gliding contacts pressing against the counter contacts under their own spring action. It was hereby found, that the bronze sheets gliding over the contacts lose their springy action due to fatigue, thus no longer exerting the necessary pressure on the contacts. The bronze brushes sometimes used scraped small filings from the contact surfaces which in turn cut grooves into the contact pieces which detrimentally affected the establishing of contact. Irrespective of the soiling of the contacts and of the bronze brushes a favorable current passage between the brushes and the contacts can no longer be maintained. There occur the so-called loose contacts between the two layers which are very detrimental to proper operation.

The interposing of a tumbler disk or similar element in resistors deviating from the circular shape overcomes this disadvantage. The pressure piece for the moving disk is preferably not constructed at the same time as the current take-off.

An embodiment of the invention is shown in various figures in the accompanying drawing.

Figure 1 shows a variable resistor in the form of a voltage divider in a top view, and wherein the contacts are disposed radially, Fig. 2 shows an elevation thereof and, Fig. 3 is a top view showing the construction of the contact surface.

The base plate 1 consisting of insulating material has the resistance contacts 2 fastened thereto. Opposite these contacts there is situated the flexible disk or contactor 3. This contactor 3 is designed as a tumbler disk, and it is pressed down upon resistor contacts 2 by means of arm or lever 4 and pressure member 5. Lever 4 is rotatably mounted about a control shaft 6. The contact disk 3 is mounted between insulating pieces 7 and 8 whereby an electric connection between the contactor 3 and the shaft 6 is avoided. In this manner it is accomplished that undesirable actions upon the voltage divider due to the capacity of the hand are eliminated during the operation of said voltage divider. Since the contact disk is arranged separately from the pressure piece 5, the lever 4 preferably consisting of spring steel provides a ready means for exerting any desired pressure upon the contact disk. The surface of the resistor contacts 2, as far as the contact surface is concerned, is provided with grooves 9 or the like. The surface of the grooving 9 is obliquely disposed relative to the shaft 6 to provide in this way a contact surface for the contactor that is as large as possible. The distance 10 between the contacts 2 is comparatively small, thereby obtaining a smooth transition from one contact stage to the other one. The resistances 11 diagrammatically shown in the drawing are interposed between the contacts 2. In order to prevent unnecessary deposit of dust particles on the voltage divider, it is advisable to enclose the latter entirely. At the same time, electrical and magnetic disturbances through outer fields are thereby avoided.

Instead of groovings and the like in the resistance contacts, the surface thereof may be smooth and the disk 3 may then be provided with grooving. In certain cases it may be of advantage to roughen the surfaces of both cooperating contacts i. e. the surface of the resistance contacts, as well as that of the member 3.

Having described our invention, what we claim as novel and desire to secure by Letters Patent is:

1. In a variable resistor, the combination of a rotatable shaft, a plurality of contacts having their surfaces formed with a plurality of grooves, a flexible conducting member normally separated from said contacts, stationary insulation discs in contact with the opposite faces of said flexible member and serving to retain it in a fixed position and an arm carried by said shaft and arranged to force a limited area of said conducting member into contact with one of said grooved surfaces.

2. In a variable resistor, the combination of a rotatable shaft, a plurality of contacts having their similar surfaces formed with a plurality of intersecting grooves, stationary insulation members surrounding said shaft, a flexible conducting member normally separated from said contacts and fixedly secured between said insulation members, and an arm carried by said shaft and arranged to force different portions of said conducting member successively into contact with said grooved surfaces.

3. In a variable resistor, the combination of a rotatable shaft, a plurality of contacts having their adjacent edges separated by a small amount and having their corresponding faces provided with a plurality of cut-out portions, a plurality of resistors each connected across the adjacent ends of two of said contacts, a yielding member surrounding said shaft and normally separated from said contacts, said yielding member being fixedly mounted with respect to said contacts, and a resilient arm carried by said shaft and in engagement with said yielding member and arranged to flex successive portions thereof into engagement with the faces of said contacts.

4. In a variable resistor, the combination of an insulating supporting member provided with an opening, an operating shaft passing through said opening, a plurality of concentrically arranged ring sector shaped contacts secured to one face of said supporting member, said contacts being slightly separated and having their exposed faces provided with a plurality of fine intersecting grooves, a flexible conducting member non-rotatably mounted adjacent said contacts and an arm carried by said shaft and arranged to urge portions of said flexible member into successive engagement with the grooved areas of said contacts.

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