May 31, 1960 E. FALCO 2,939,097

VARIABLE RESISTANCE DEVICE

Filed March 11, 1959

Fig. 1

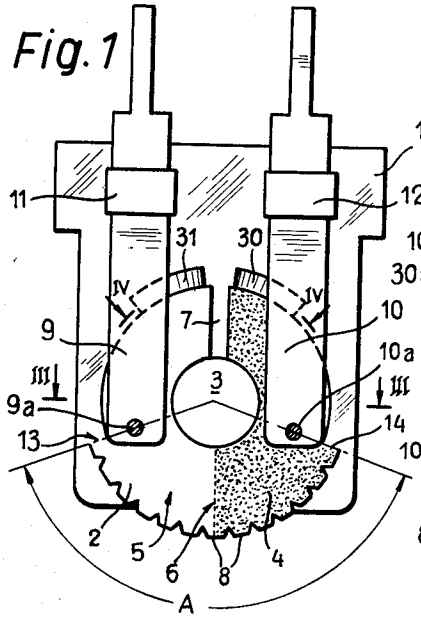


Fig. 2

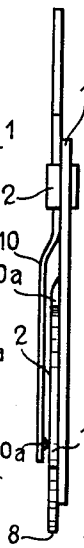


Fig. 3

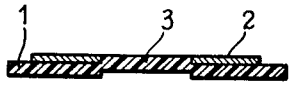


Fig. 4

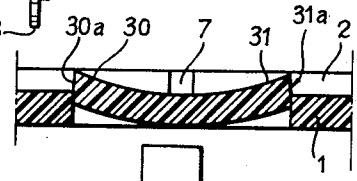
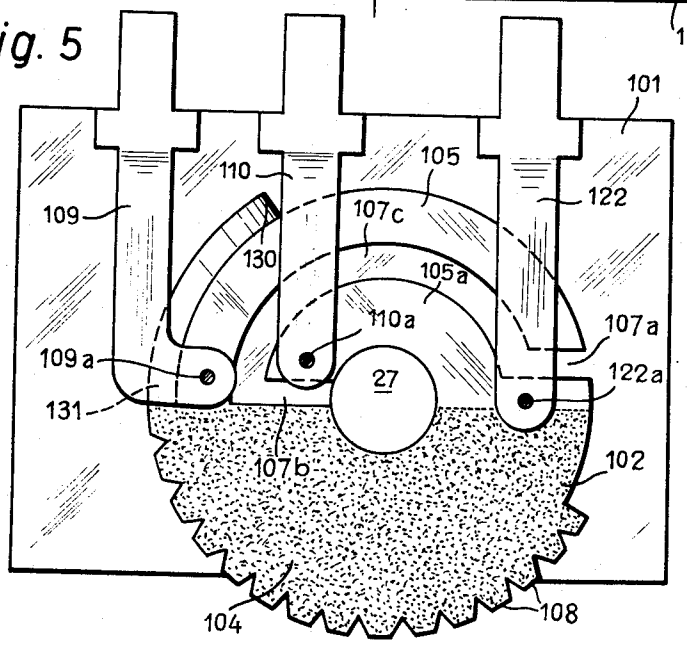


Fig. 5



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VARIABLE RESISTANCE DEVICE

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3 Claims. (Cl. 338—150)

This invention relates to improvements in variable resistance devices, more particularly for use in electronics, the television or wireless telegraphy field.

In the above fields variable resistors are known which are more particularly used in potentiometers. Said resistors mostly comprise a graphite base material mounted on a support and connected with two terminals, a slider being movable between the terminals. It is more particularly advantageous to employ in the circuits adjustable resistors on account of the growing importance of transistors, which admit of fairly wide allowances.

Various devices are known in which the resistor is rectilinear, the slide moving in this case along a straight line; alternatively, the resistor is curved, the slider moving along a circumference.

The above known devices suffer from the main drawback that a relatively large number of components have to be assembled, among which the movable slider is relatively delicate and uneasily accessible.

The devices comprising rectilinear resistors are relatively tough, but the slider, which is connected with a lead, carries along the latter on displacement, which is apt to damage the lead and cause difficulties in assembly.

The curved resistor devices comprise a slider movable along a circumference connected to a stationary head portion arranged at one end of the resistor. This arrangement avoids the abovementioned drawback, but necessitates on the other hand the provision of a larger number of components.

The improvements according to this invention fully remove all the abovementioned drawbacks.

The resistor comprises a rotatable disc carrying on its surface a conductive material and a material of higher resistivity than the former, respectively, said materials contacting each other along a disc radius and being separated by a slit extending along another disc radius. Contact strips are arranged to be in sliding contact with the conductive material and the less conductive material, respectively, rotation of the disc interposing between said contact strips a greater or smaller length of the less conductive material to thereby increase or reduce resistance.

The disc is serrated at its periphery for easily rotating it by one finger.

According to a characteristic feature of this invention a variable resistor, such as defined above, can be utilized in a potentiometer. For this purpose the two contact strips through which voltage reaches the device, are arranged in sliding contact with the higher conductive material, at the periphery and towards the center thereof, respectively, a separation being provided between the peripheral and central portions with which the strips are in contact, respectively. The material of higher resistivity is arranged beneath a third strip and movable in sliding contact therewith.

In the abovementioned use in connection with a potentiometer, rotation of the disc results in interposition of

a greater or smaller length of material of higher resistivity between the third strip and either current feed strip.

The device according to this invention provides a rotatable resistor instead of a rotatable slider, whereby a much smaller number of movable parts are required, which is of considerable advantage on assembly.

The accompanying drawings show two embodiments by way of example and not of limitation of devices provided with the instant improvements.

Figure 1 is a plan view of a variable resistance device,

Figure 2 is a side view of Figure 1,

Figures 3 and 4 are part sectional views on lines III—III and IV—IV of Figure 1, respectively and

Figure 5 is a plan view of a rotatable resistor potentiometer.

Figures 1–4 show a support **1** in the form of a plate of relatively rigid insulating material, having mounted thereon a disc **2** fitted by a central aperture on a hub **3** on the support. The hub acts as a shaft for the rotatable disc **2**. More particularly, the hub can be formed by part-punching of a support **1** of cardboard impregnated with the material known by the trade name Bakelite (Figure 3). The surface of the disc **2** is made at **4** of a material of higher resistivity and at **5** of a material of lower resistivity, such as a silver layer, the two materials contacting each other at **6** along a disc radius and being separated at **7** by a slit extending along a further diametrically opposed radius.

The disc is formed with a circumferential serration **8** through which its rotation can easily be controlled by one finger. Two contact strips **9, 10**, secured by means of clips **11, 12** to the support **1**, bear at two approximately diametrically opposed regions on the disc. The strips **9, 10**, are each formed with an impression **9*a***, **10*a***, respectively, extending towards the disc **2** and acting as a sliding contact. This impression holds its respective strip in parallel spaced relationship to the disc **2**, whereby an electric contact between the strip and disc is established through this impression only.

On rotation of the disc a greater or smaller length of the material **4** of higher resistivity is interposed between the strips **9, 10**, in order to increase or decrease resistance. Stops can be provided on the support in order to limit the disc rotation, the said stops coming into contact with steps **13, 14** provided at the disc periphery. The stops can easily be obtained by part-punching of the support **1**. As will be seen from Figures 1 and 4, two arcuated tongues **30, 31** obtained by part-punching are formed along an arcuated region adjacent part of the circumference of the disc **2**, the tongue ends extending beyond the face of the support **1** carrying the disc **2**. The tongues each form an abutment surface **30*a***, **31*a***, respectively, which is abutted by its respective step, **14**, **13**, respectively, on the disc **2**.

In the embodiment shown the angular width of the serrated region **8** on the disc and of the tongues **30, 31** are designed to afford a rotation of the disc through 180°, namely 90° to the left and 90° to the right of the middle position shown. On rotation of the disc, such as in clockwise direction from the position shown, the effective length of the resistive layer **4** is increased on the path between the sliding contacts **9*a***, **10*a***. Moreover, in the embodiment shown this path extends over an arc A smaller than 180° so that, in one of the end positions of the disc, both sliding contacts **9*a***, **10*a*** are situated on the resistive layer **4**, while in the opposite end position of the disc both contacts are situated on the conductive layer **5**. In the first mentioned end position the resistance of the path is highest, while it is lowest or even nil in the second mentioned position.

From a mechanical standpoint it should be noted that the disc **2** is pressed against the support **1** by the pressure of the strips **9**, **10**, only. Manufacture and assembly of the device are thereby considerably simplified.

Figure 5 shows a potentiometer. As distinct from the embodiment shown in Figures 1–4, in which the slit **7** in the disc **2** extends in a radial direction, the slit in the disc **102** shown in Figure 5 is of a complex form comprising two substantially radial portions **107***a*, **107***b*, approximately diametrically opposite each other, merging into each other by an arcuated portion **107***c* concentrical with the disc. The structure of the disc **102** therefore includes two concentrical arcs, namely an outer arc sector **105** and an inner arc sector **105***a*, which angularly extend in opposite directions from a sector **104** the angular width of which but slightly exceeds 180°. The arcs **105**, **105***a* are covered with a material of low resistivity, the sector **104** being covered with a material of high resistivity.

The strips **109**, **110** are connected with the current inlet leads, the voltage difference being applied between the said strips.

On rotation of the disc **102** which can be moved by one finger acting on the serrations **108**, the sliding contact **109***a* on the strip **109** remains in contact with the arc **105**, the contact **110***a* on the strip **110** contacting the arc **105***a*, whereby current flows through the material **104** of higher resistivity. A strip **122** is so arranged that in the various possible positions of the disc **102** the sliding contact **122***a* is in contact with the material **104** for the purpose of interposing a greater or smaller width of resistive material between itself and each of the strips **109** and **110**.

In Figure 5 the disc is shown in one of its end positions, in which the sliding contact **122***a* on the strip **122** is in proximity to the arc **105***a* of lower resistivity. The disc **102** is capable of rotation from this position in anticlockwise direction only.

Stops **130**, **131** can be arranged on the supporting plate **101** in order to stop the disc **102** in its extreme angular positions.

In the opposite end position of the disc, when the latter is rotated approximately through 180° away from the position shown, the strip **109** is still in contact with the arc **105** at the free end region of the latter. The strip **110** still contacts the arc **105***a* at the root section of the latter, the strip **122** being in contact with the material **104** in proximity to the root section of the arc **105**. In this case the resistance interposed between the strips **120**, **109** is lowest.

Similarly to the embodiment shown in Figures 1–4 the disc **102** is mounted on its support **101** having a hub **103** which acts as a shaft on which the disc **102** rotates.

It will be understood that this invention is not limited to the constructional embodiments described above and includes any modification thereof.

The invention further covers any embodiment having a resistor comprising a movable member having two arms sliding beneath two current feed strips, the displacement of the movable element in either direction increasing or decreasing the length of the electrical resistant path between the said strips.

What I claim is:

1. A potentiometer device comprising a supporting plate of an electrically insulating material, a boss protruding from one planar face of the plate, a disc rotatable on the boss, said disc including a sector-shaped section having a resistive exposed surface, and a pair of oppositely extending concentrical arc sections having conductive exposed surfaces, and three metal strips fixed on the supporting plate having each a free end section pressing the disc against the said planar face, the freed end sections of two of the said strips abutting on the arc sections of the disc, respectively, in a sliding contact therewith, and the free end section of the third strip abutting on the sector-shaped section of the disc, whereby a more and less resistive path is interposed between the third strip and the said two of the said strips, respectively, on angularly displacing the disc on the boss.

2. A variable resistance device comprising a supporting plate of an electrically insulating material, a pair of metal strips fixed on the plate in a mutually spaced electrically insulated relationship, said strips having each a free end section extending over one face of the plate, a boss on the said face of the plate at a location intermediate the free end sections of the strips, a disc-shaped resistor member rotatable on the boss, the said resistor member being applied against the said face by the said free end sections of the strips and having its strip-engaging surface including more and less resistive areas thereby providing a current path between the strips the resistance of which is a function of the angular position of the resistor member on the boss, and cooperating stop means fast with the resistor member and plate, respectively, defining angular end positions of the member relative to the highest and lowest resistance values, respectively, of the current path.

3. In the device as claimed in claim 2, the said stop means comprising a pair of radial steps angularly spaced on the circumference of the resistor member, and a pair of tongues part-punched in the plate having their tip sections protruding on the path of the respective steps on the member to thereby stop the member in angularly different end positions.

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