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VARIABLE RESISTANCE

Original Filed Aug. 16, 1943

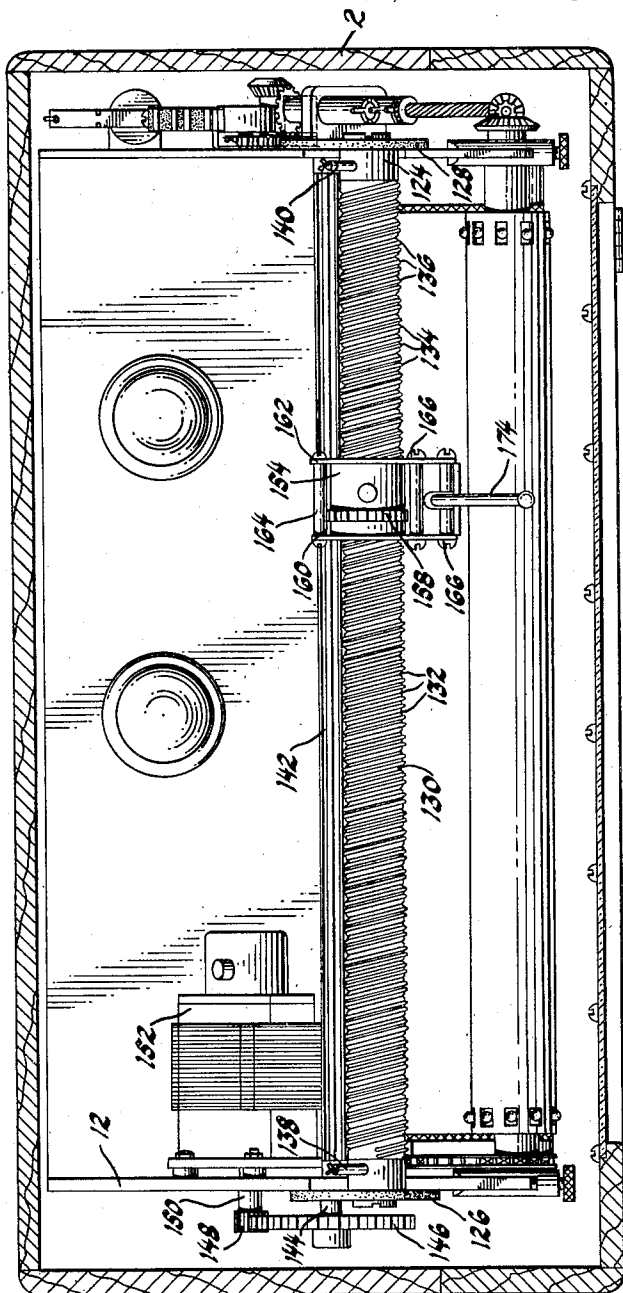


Fig. 1

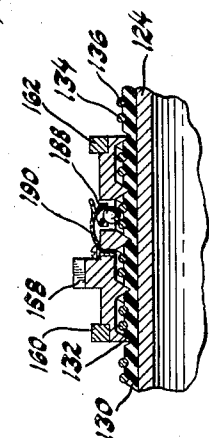


Fig. 3

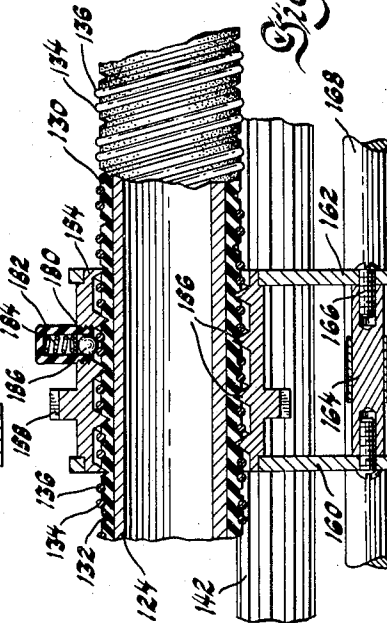


Fig. 2

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VARIABLE RESISTANCE

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Original application August 16, 1943, Serial No.
498,777. Divided and this application August
1945, Serial No. 821

4 Claims. (Cl. 201-56)

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This invention relates to variable electrical resistance means and more particularly to variable resistance means in which the resistance is varied in infinitely small increments and is a division of Serial No. 498,777, filed August 16, 1943, entitled "Recording mechanism."

The use of resistance in electric circuits whose value can be varied is very wide spread. One of the common forms of variable resistance which is used particularly in laboratory or research instruments is the slide wire type in which a length of resistance wire is wound upon a cylinder and an adjustable contact is so mounted as to slide axially there along varying the number of turns of wire in the circuit and therefore the resistance. With this type however, the smallest change in resistance that can be obtained is the value of a single turn and the resistance therefore changes as the contact is moved axially by the value of one complete turn at a time. This in some instances may be entirely a too rough a variation to be used in particularly sensitive recording means or other similar constructions.

It is therefore an object of my invention to provide variable resistance means which can be varied in infinitely small increments.

It is a further object of my invention to provide a variable resistance utilizing resistance wire throughout the length of which a contactor may be moved to vary the amount of resistance in the circuit.

With these and other objects in view, which will become apparent as the specification proceeds, the embodiments of my invention will be best understood by reference to the following specification and claims and the illustrations in the accompanying drawing, in which:

Figure 1 is a sectional view through a recording mechanism in which my invention is incorporated.

Figure 2 is an enlarged view partially in section showing the variable resistance of my invention.

Figure 3 is a view similar to Figure 2 showing a modified form of my invention.

As mentioned above, one of the constructions in which a very sensitive variable resistance is necessary might be that of a temperature recorder such as shown in the application above mentioned, of which this is a division and there is shown in Figure 1 a casing 2 housing a recording mechanism as above described. The variable resistance assembly in this case comprises a tube 124 which is insulatedly mounted with regard to the frame by means of two insulating plates 126 and 128 at the opposite ends. Upon

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the exterior face of this tube is mounted a cylinder 130 of Micarta or similar insulating material which is relatively thick. In the exterior surface of this member there is provided a spiral groove 132 which extends substantially the full length of the member thus forming between the grooves a spiral raised surface. A pair of parallel spaced conductors 134 and 136 are wound upon this surface and in similar spiral manner extend the full length of this insulating material. The opposite ends of one of these conductors is brought out through the insulated bushings 138 and 140 and the end of the other conductor is likewise brought out through the insulated bushing 140, thus forming three terminals to be connected to a circuit.

Rotatably mounted below and slightly to the rear of this tube is a long shaft 142 having axially extending teeth for substantially its full length, this shaft is trunnioned in the side walls of the frame 12 extending through the left hand wall to provide a smaller shaft section 144 upon which is mounted a spur gear 146. This engages a small driving pinion 148 mounted on a shaft 150 of a reversible drive control motor 152. Therefore, when the motor 152 is energized, shaft 142 is rotated, and since the motor is reversible, this rotation may take place in either direction.

A short cylindrical sleeve member 154 having inwardly projecting teeth 156 on its inner surface, said teeth being of spiral configuration, is fitted over the insulating Micarta tube 130 and is adapted to move axially along the same. Therefore, if the sleeve is rotated the projecting teeth which engage the spiral groove 132 in the micarta tube will cause the cylindrical member 154 to move along axially and assume the character of a travelling nut. Upon the outer surface of the cylindrical member 154 there is provided an integral set of spur gear teeth 158 which are adapted to mesh with the long axial teeth of the rotatable member 142 to cause the member 154 to rotate about the axis of the tube 124. Spaced supporting members 160 and 162 engage the opposite ends of the cylindrical member 154 and provide bearing means for the sleeve. These spaced members are held in proper position by spacer means 164 secured thereto by screws 166. Thus the member 154 may rotate within the frame so formed about the surface of the Micarta tube 130 and as it does so causes axially movement of the sleeve along the tube. The ends of the members 160 and 162 project downwardly and are adapted to contact a cross bar 168 to prevent the whole assembly from turning around

the axis of the shaft when the gear 153 is driven. Recording means such as a stylus 174 is provided on the carriage in this instance for recording purposes.

At one position in the surface of the sleeve 154 there is provided a small internally threaded opening, which opening is spaced between two of the projecting teeth 153. Into this opening is threaded a short hollow Micarta cup 132 having inside a small compressed spring 134 which presses against a contact ball 136 forcing it down into contact with the upper surface of the two adjacent wires 134 and 135 thus bridging the gap between the two and causing a conductive connection at this point. As previously mentioned, one of the wires is utilized as a resistor in a measuring circuit and the other wire being utilized as a conductor from the point of contact into the measuring circuit. Therefore, if the ball or contact moves along the full length of the resistance wire we obtain an infinitely variable resistance and at the same time connect to any part of the resistance wire a conductor for carrying current back to the apparatus. Thus, as the cylindrical member 154 rotates about the Micarta sleeve 130, the contact ball 136 rolls spirally down the full length of the wire to change the resistance as desired and at the same time by bridging action causes such balancing resistance point to be connected into the circuit without any contact wire being carried by the movable or rotating carriage.

Figure 3 shows a slightly modified form of travelling cylindrical means in that in that instance instead of the contact ball 136 being held in place by a Micarta cup screw-threaded into an opening of the surface of the member 154, it is in this instance merely held in place by a small insulating disc 138 which is spring biased toward the axis of the Micarta tube by a small spring lever 139.

I have thus provided an infinitely adjustable resistance which can be connected into a sensitive measuring circuit and there is no sudden step jumps in the value of resistance as would be provided in a wound resistor in which the contact member merely slides across from one turn of the coil to the other, but due to the spiral drive, the travelling contact or ball rolls along the full length surface of the spirally wound wire as it is driven from one end to the other. It might be further added that this construction has the added advantage that a long wire may be spirally wound between relatively short end positions to provide a further increased variation in the resistance.

I claim:

1. In resistance means, a cylindrical member

formed of insulating material having a spiral groove in its external surface, a pair of spaced conductors having resistance to current flow wound on the surface of the member between the grooved portions, means encircling a portion of the cylindrical member having projecting teeth that extend into the groove, means for movably and rotatably mounting the last named means whereby as the latter is rotated it will move axially along the surface of the cylindrical member, and conductive means mounted on the rotatable means to bridge the gap between the two conductors at a point as the rotatable means moves along the member.

2. In resistance means, a stationary cylindrical member formed of insulating material having a spiral groove in its external surface, a pair of spaced conductors spirally wound on the surface of the member between the grooves, means rotatably mounted on the member having projecting portions extending into the groove to cause axial movement of the same, conducting means extending between the conductors mounted on the rotatable means to conduct current from one to the other and wipe over the entire surfaces of both as the rotatable means is rotated.

3. In resistance means, a cylindrical insulating form having a spiral groove in its surface, a pair of conductors spirally wound in parallel relation on that section of the form between the grooves, a rotatable sleeve mounted around the form having projections extending into the grooves and a spring biased ball having a diameter greater than the distance between the conductors carried by the sleeve and rolling upon the surface of both conductors as the sleeve is rotated to interconnect the conductors at all times as the sleeve moves axially of the form.

4. In resistance means, a stationary cylindrical member formed of insulating material and having a spiral groove in its exterior surface, a pair of spaced parallel conductors spirally wound on the surface of the member between the grooves, an insulating sleeve rotatably mounted on said member having internal projecting portions extending into the groove to cause axial motion of the sleeve along the member as the sleeve rotates, said sleeve having an opening in its surface in alignment with the parallel conductors enclosed therein, a cylindrical cap threaded into said opening, a spring within said cap and a ball engaging the spring and adapted to roll on the surfaces of the parallel conductors to form a conductive path between the two as the sleeve progresses spirally along the cylindrical member.

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