Sept. 29, 1953

E. UMRATH

2,654,013

SLIDE WIRE DEVICE FOR RECORDERS

Filed June 3, 1952

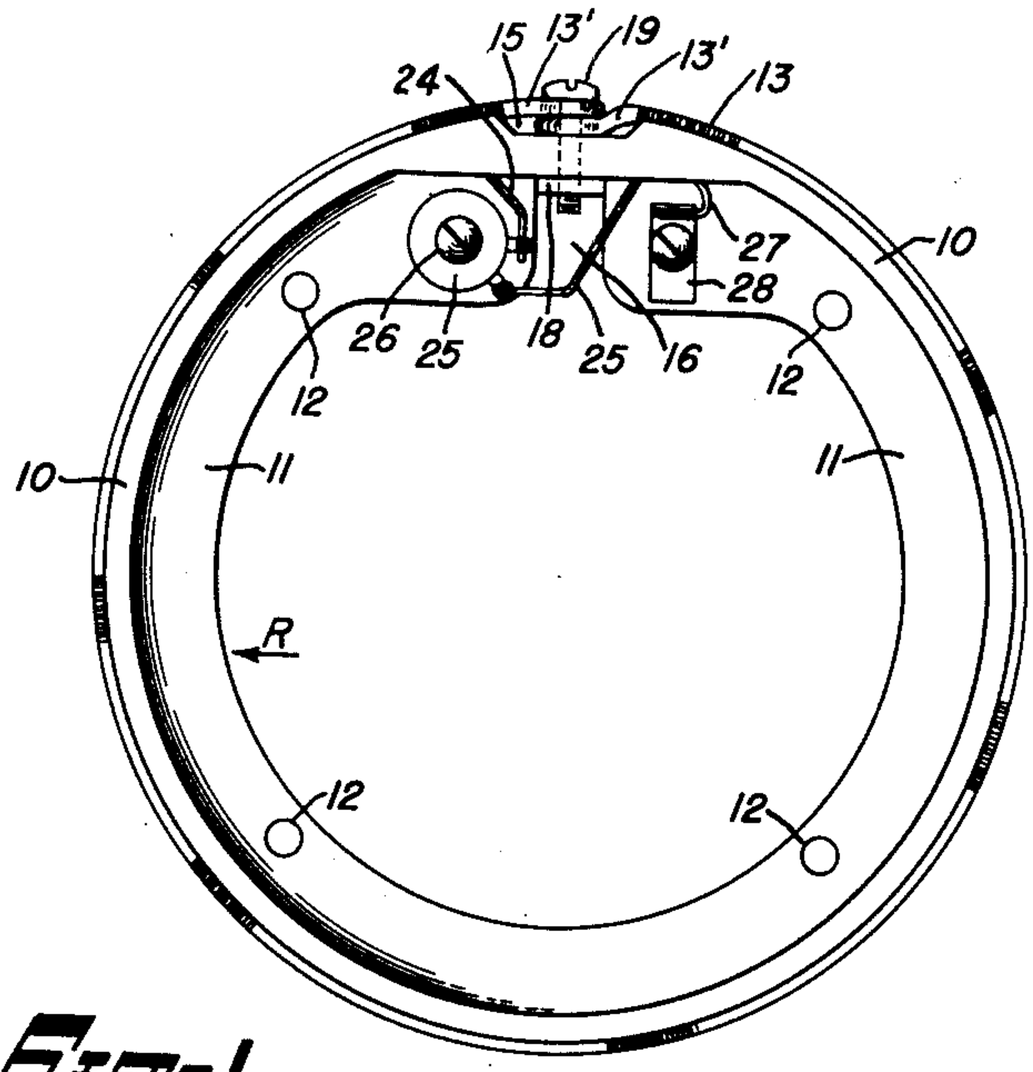

Fig-1

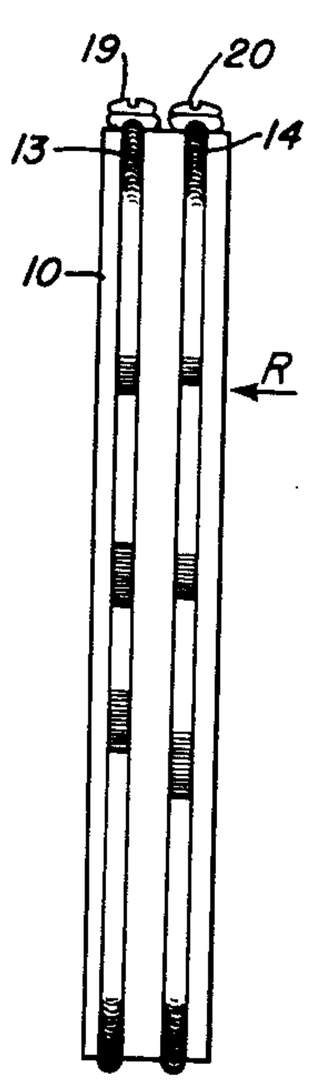

Fig-2

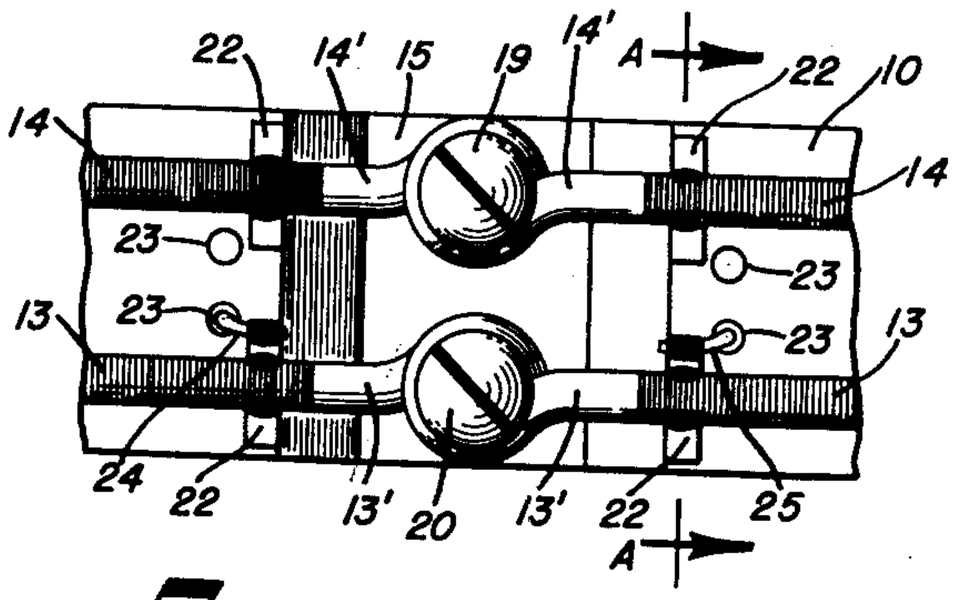

Fig-3

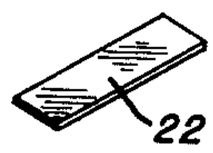

Fig-4

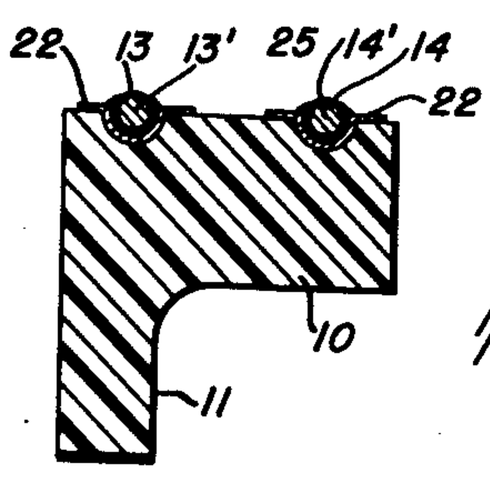

Fig-5

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Patented Sept. 29, 1953

2,654,013

UNITED STATES PATENT OFFICE

2,654,013

SLIDE WIRE DEVICE FOR RECORDERS

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Application June 3, 1952, Serial No. 291,429

3 Claims. (Cl. 201—56)

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This invention relates to improvements in automatic indicating and recording apparatus and more particularly to a novel construction of the slide wire device used in recorders of the potentiometer type.

Recorders of the type to which this invention relates are useful in providing a measurement and record of variable conditions such as, for example, temperature, pressure, etc., which can be converted into electrical quantities. The indication and recording of the instantaneous state of the variable condition is accomplished by electrical networks which are adapted to be unbalanced by a change in the condition to effect operation of a suitable rebalancing means. Such rebalancing operations include the automatic actuation of suitable power means for simultaneously moving an inking pen over a constantly movable, calibrated chart. In devices of this type, the rebalancing of the electrical network is done by means of a slide-wide potentiometer comprising a helically wound resistance wire and a slider, the point of contact between the slider and the resistance wire being varied by an electric motor that is energized upon network unbalance. Such potentiometer slide wires may be either of the linear or circular type and the present invention is directed particularly to improvements in devices of the latter class.

In order to eliminate the necessity for supplying a special slide-wire device for each different operating range of a recorder and to make such devices interchangeable among different recorders of the same range, it is essential that all such devices include resistance wires having uniform electrical resistance and equal angular lengths. I accomplish the former requirement by employing an adjusted shunt resistance across each resistance wire and I accomplish the latter requirement by means of a simple construction whereby the effective, arcuate extent of the resistance wire is disassociated from the mechanical means by which the wire is fastened to the supporting member.

An object of this invention is the provision of slide wire device for recorders wherein the helical resistance wires of a plurality of such assemblies will have uniform electrical resistance and angular length.

An object of this invention is the provision of a slide wire assembly for recorders comprising a circular support of insulating material, a helical resistance wire disposed along the periphery of the support, fastening means securing the wire in fixed position relative to the support, contact

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terminals disposed between the wire and the support and electrically connected to the wire at predetermined points and an adjusting resistor carried by the said support and connected to the said terminals, said resistor being adjusted to bring the overall resistance of the helical wire and resistor to a predetermined ohmic value.

An object of this invention is the provision of a slide wire assembly for potentiometric recorders comprising a ring member of insulating material, a pair of helical resistance wires wound on and insulated from individual core wires disposed in spaced relation along the periphery of the ring member, means fastening the ends of the core wires to the ring member; contact terminals disposed between the helical wires and the peripheral surface of the ring member, said terminals being connected to the helical wires at predetermined points, and an adjusting resistor carried by the ring member and connected to two terminals that are connected to a single helical wire, said resistor being adjusted to bring the overall ohmic resistance of the resistor and the associated helical wire to a predetermined value.

These and other objects and advantages will become apparent from the following description when taken with the accompanying drawings illustrating the invention. The drawings are for purposes of illustration and are not to be construed as defining the scope or limits of the invention, reference being had for the latter purpose to the appended claims.

In the drawings wherein like reference characters denote like parts in the several views:

Figure 1 is a front view of a slide wire device made in accordance with this invention;

Figure 2 is a side view of the device;

Figure 3 is a fragmentary top view of the device and drawn to an enlarged scale for purposes of clarity;

Figure 4 is an isometric view of a contact terminal in the form of a thin copper ribbon; and

Figure 5 is a sectional view taken along the line A—A of Figure 3.

The supporting member of my slide wire device comprises a unitary ring member R, made of a suitable plastic, and including the flange 10 and the radially-extending skirt 11, the latter including a plurality of holes 12 for the accommodation of suitable screws by which the device can be fastened within a recorder. The peripheral surface of the flange 10 includes semi-circular grooves within which the helical resistance wires 13, 14 are disposed. Each resistance wire is wound on individual cores that consist of rela-

tively-heavy, solid wires 13', 14', said core wires being covered by a suitable insulating compound in accordance with conventional practice in this art. Those skilled in this art will understand that the resistance wire also is covered with a suitable insulation coating and that such wire is passed through a suitable cement as the wire is wound on the core wire. When hardened, the cement serves to retain the convolutions of the resistance wire in proper fixed position relative to the core wire. After the core wires are disposed within the grooves of the ring member and the ends thereof are secured in position, a suitable solvent is employed to remove the cement and the insulation from the exposed portions of the resistance wire whereby electrical contact can be established between the two helical resistance wires 13, 14 by a contact slider rotatable about an axis coinciding with that of the insulator ring member.

The upper portion of the insulator ring member R is provided with a recess 15 to accommodate the overlapped ends of each core wire and the skirt 11 includes a cut-out portion 16 to accommodate a rectangular plate 18 extending laterally across the flange. Each end of the core wires 13', 14' is formed into a substantially-closed eyelet and the screws 19, 20 passing through the alined eyelets and through radial clearance holes in the flange 10 are threaded into suitable holes provided in the plate 18. It will be apparent the screws 19, 20 will pull the core wires downwardly relative to the edges of the recess 15 thereby drawing the helical wires tightly into the grooves in the flange 10 resulting in a firm anchorage of the wires with respect to the insulator ring member.

Contact must be made with the helical resistance wires 13, 14 in order to connect them to an electrical circuit. I do this by novel means which serve, at the same time, to establish the precise effective angular length of each such resistance wire. Four contact terminals 22, (see Figure 4) consisting of copper ribbon about .010'' thick, are inserted under the helical resistance wires before the fastening screws 19, 20 are fully tightened in position. As shown in Figure 3, these terminals are disposed transversely with respect to the flange 10, of the ring member, and, therefore, each terminal spans the groove within which the helical resistance wires are to be located. The terminals associated with each of the resistance wires are positioned at precise points on the flange surface by alining the side edges of the terminals with reference lines, such lines being applied to the flange surface by employing a suitable fixture whereby each associated pair of lines will define an exact angle, say 337½ degrees, measured along the peripheral surface of the flange. The fastening screws 19 and 20 are then screwed tightly into the threaded holes in the lower plate 18 thereby drawing the helical wires 13, 14 into the grooves. Since the contact terminals 22 are made of a thin, soft metal they conform to the shape of the grooves, as shown in Figure 5. When so pressure-deformed the terminals are secured firmly in position by the radial pressure of the helical wire. A drop of soldering flux is then placed on each terminal at the point of contact between the terminal and the convolutions of the helical resistance wire and solder applied thereto by means of a soldering iron. The solder adheres effectively to the contact terminal and the overlying convolutions of the helical slide wire, as shown by the solid

black spots in Figures 3 and 5. It is here pointed out that when the soldering operation is done with reasonable care the solder does not overflow the edges of the contact terminal and there will be no solder on the upper surface of the helical wire. The latter consideration is important as the conventional brush contact, which slides over the exposed surfaces of the helical resistance wires, can move over the soldered regions of the wires without becoming smeared with soft solder which often causes operating irregularities in the electrical network. Inasmuch as the individual contact terminals have been positioned at precise points along the peripheral surface of the insulator ring member and since the electrical contact between the helical resistance wire and the associated terminal can readily be established within the limit of 1 convolution, it will be clear each helical resistance wire is set to a precise, effective, angular length and such setting of the angular length is disassociated from the mechanical means by which the wires are fastened to the ring member.

The above-described procedure for establishing the precise angular position of the contact terminals, and the precise angular length of each resistance wire, is satisfactory when the grooves in the surface of the supporting flange are semi-circular and have a radius substantially equal to that of the helically-wound resistance wire. However, the invention is not limited to such specific arrangement. When the grooves are other than semi-circular as, for example, rectangular, the contact terminals can be preformed to the curvature of the resistance wire and cemented to either the flange surface or to the groove bottom to prevent displacement thereof as the fastening screws 19 and 20 are tightened into position.

As shown in Figure 3, the flange 10, of the ring member, is provided with four holes 23 each positioned adjacent to one of the contact terminals 22 and through which connection leads can be brought to the contact terminals. Individual connection leads 24, 25, having ends soldered to the contact terminals 22 that are associated with the helical slide wire 13, pass through the associated holes 23 and are connected to the end terminals of a resistance spool 25, (see Figure 1) that is secured by the screw 26 to the skirt 11 of the ring member. The spool resistance, therefore, is connected directly across the effective ends of the slide wire 13 and its ohmic value is pre-adjusted to bring the overall resistance of the spool and wire to a predetermined value. In accordance with conventional practice, the effective ends of the other slide wire 14 may be connected together by suitable lead wires soldered to the associated contact terminals and joined to a common lead wire 27 that is soldered to the terminal 28, the latter being secured to the skirt of the ring member by a screw, as shown.

It will now be apparent slide wire devices made as herein described will have uniform electrical resistance and angular lengths thereby making such devices interchangeable among different records which feature greatly facilitates the manufacture of recorders and their maintenance and repair in the field.

Having now described my invention in detail in accordance with the patent statutes what I desire to protect by Letters Patent is set forth in the following claims.

I claim:

1. In a slide wire device for recorders the com-

bination of a ring member of insulating material having a pair of parallel grooves and a radial recess formed in the peripheral surface; a pair of helical resistance wires wound on individual cores and partially disposed within said grooves, said wires being insulated from the cores and each core having ends formed in loops disposed within the recess; fastening means securing the core loops to the ring member in overlapping relation; flexible contact terminals clamped between the resistance wires and the ring member, said terminals including central portions conforming in contour to that of the helical wires and said terminals being connected to the resistance wires at precise points spaced apart a predetermined number of angular degrees; and an adjusting resistor carrier by the ring member, said resistor having ends connected to the contact terminals associated with one of the resistance wires.

2. The invention as recited in claim 1, wherein the ring member includes an integral, radially-extending skirt and the said adjusting resistor comprises a wire-wound spool secured to the said skirt.

3. In a slide wire device for recorders the combination of an insulator ring member consisting of a flange section and an inwardly-directed skirt section, said flange section having a radially-directed recess and a pair of semicircular grooves in the outer peripheral surface; a

pair of resistance wires helically wound on individual core wires and partially disposed within said grooves, said core wires being insulated from said resistance wires; eye-loops formed on the ends of each core wire and disposed in overlapping relation within the said recess; fastening screws passing through the eye loops of each core wire and through radial holes in the flange section into threaded engagement with a nut disposed against the inner surface of the flange section, said fastening screws drawing the resistance wires tightly within the grooves; individual contact terminals disposed within the grooves and solder-connected to the resistance wires at precise points spaced apart a predetermined number of angular degrees; an adjusting resistance spool carried by the said skirt section; and a pair of connecting leads passing through radial holes in the flange section, said leads being connected between the ends of the resistance spool and the contact terminals associated with one of the helical resistance wires.

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