

Nov. 28, 1933.

V. P. CLEAR

1,936,934

MACHINE FOR MAKING RESISTANCE ELEMENTS

Original Filed Jan. 31, 1931. 2 Sheets-Sheet 1

Fig. 1

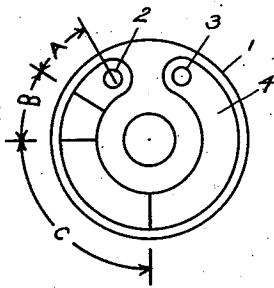


Fig. 2

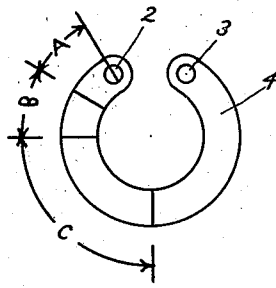


Fig. 3

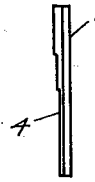
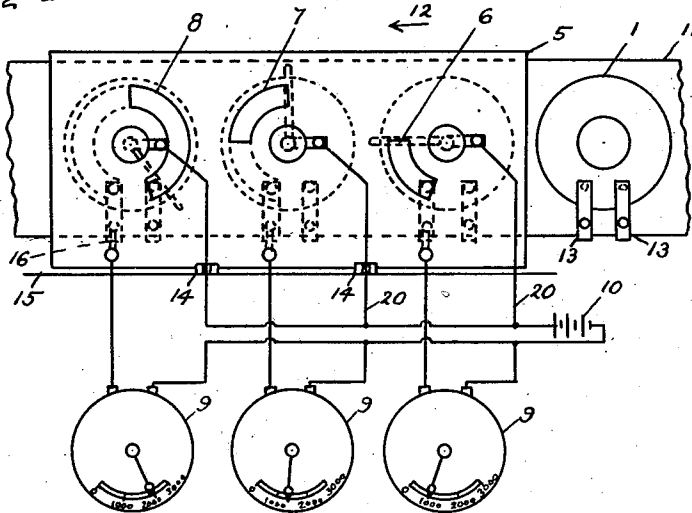


Fig. 4



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Fig. 5

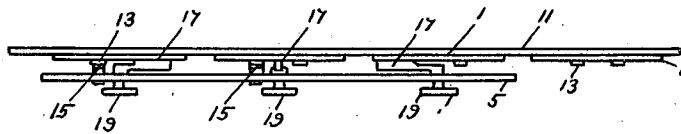


Fig. 6

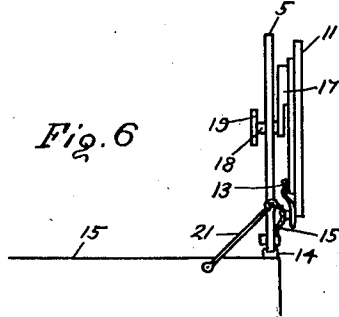
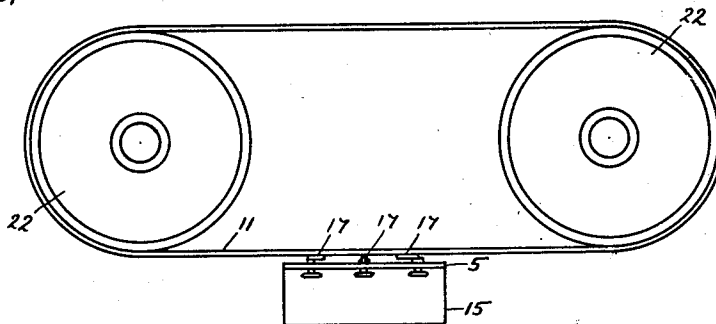


Fig. 7



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MACHINE FOR MAKING RESISTANCE
ELEMENTS

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Original application January 31, 1931, Serial No.
512,687. Divided and this application Sep-
tember 26, 1931. Serial No. 565,378

3 Claims. (Cl. 91-45)

My invention relates to apparatus for making resistance elements and has a particular reference to apparatus or devices for applying thin layers of resistance composition to insulation discs or rings.

This is a divisional application for my application Serial No. 512,687, filed Jan. 31, 1931.

With ordinary methods of making resistance elements for radio circuits by painting or impregnating discs with resistance composition, it is very difficult to obtain the exact required specific resistance of the layers, especially when it is necessary to use layers of different specific resistance in different portions of discs. It is very important, however, that such resistance elements should have the same value of resistance in ohms for a given angle of movement of contact fingers. The resistance discs are usually divided into sections or segments of different resistance, for instance, the first section of 1000 ohms, then sections of 50, 100 etc. ohms.

When such elements are made by applying the composition with paint brushes or by similar methods, it becomes necessary to apply very thin coats so that the process becomes very slow. The limits required can be easily exceeded in which case it is necessary to scrape off the excess of composition.

I discovered that by using a quick drying resistance composition, which forms a subject matter of a separate application, and spraying this composition on resistor discs by means of ordinary compressed air sprayers, it is possible to continuously check the resistance of the layer in ohms for a given section of the disc which is being sprayed, stopping the process at the exact moment when the resistance reaches the required value.

The spraying is limited to one section of a disc by using shields with apertures corresponding to the shape of the section to be sprayed. One section at a time is prepared by this method, different sections being sprayed differently so as to obtain different required specific resistances.

During this spraying operation I pass a current through the section which is being sprayed, with a direct reading ohmmeter which indicates the moment when the exact value of the resistance is reached. The spraying is then stopped.

My invention is more fully described in the accompanying specification and drawings in which—

Fig. 1 is a plan view of my resistance element, Fig. 2 is a modification of same, Fig. 3 is an edge

view of same, Fig. 4 is a partial front view of my device for preparing these elements, Fig. 5 is a top view of same, Fig. 6 is an end view of same, and Fig. 7 is a plan view of the whole device.

My resistance element consists of a disc 1 made of a suitable insulating material, such as fiber, bakelite, glass, paper, porcelain etc. It is provided with apertures 2 and 3 at the ends of a conducting resistance layer 4. This layer is made of a graphite composition. Any suitable composition can be used for this purpose, possessing suitable specific or unit resistance, but I found that the best results are obtained with a quick drying waterproof composition, forming a subject matter of the above mentioned separate application.

With my composition it is possible to obtain any desired degree of resistance by regulating the thickness of the layer 4. The solution dries almost instantly when sprayed on the surface 1 thereby reaching its final resistance value which can be indicated on suitable measuring instruments.

In order to obtain a layer of the required width and shape (contour) I am using special spraying shields or stencils 5 with apertures 6, 7 and 8. The apertures are arranged successively so as to form a continuous ring from one hole 2 to the other 3. With this arrangement it is possible to build up different thicknesses of the composition in different sectors thereby obtaining different specific resistances for these sectors, the resistance being constant for each sector. The first sector, for instance, can be made of a high resistance, such as 1000 ohms, the next sector—50 ohms, then 100 etc., in accordance with the requirements of the makers of radio sets for this class of apparatus (potentiometers, grid leak resistance, tone or volume control etc.).

With my shields it is possible to build up a ring-shaped layer on the surface of an insulation disc, leaving margins on the sides in order to separate the resistance ring from the metal housing of the apparatus.

In order to build up layers of the exact required resistivity I use an arrangement for a continuous resistance control by means of direct reading ohmmeters 9 included in a circuit of a battery 10 or a similar source of electric current. The discs 1 are supported on a board or belt 11 which can be moved in direction of an arrow 12. Resilient clips 13 fit with their ends in the holes 2 and 3 thereby supporting discs in a correct position on the belt.

The spraying shield 5 is placed in front of the belt on hinges 14 attached to the edge of a table 15 or other suitable support. The shield has resilient contact members 16 adapted to press on the clips 13 corresponding to the holes 2, these contact members being connected with one terminal of the ohmmeter 9. Contact arms 17 are rotatively supported on shafts 18 with thumb heads 19 extending to the other side of the shield 5 for adjusting the angular position of these arms. They are made of a conducting material and are adapted to press on the discs 1 at points of division between successive resistance sectors. These arms are electrically connected (by means of wires 20) with the other terminal of the ohmmeter 9.

A hook 21 supports the shield 5 in an operative position in front of the belt 11.

The shield 5 is preferably made of an insulating material such as fiber, or molded compositions or it can be of metal in which case the contact members and arms must be insulated from the shield.

The belt 11 is placed on wheels 22.

The shield 5 has several groups of contact members 16 and 17 according to the number of different sectors "A", "B", "C" etc. each group being preferably connected with an individual ohmmeter.

The operation of my spraying arrangement is as follows.

Discs 1 are placed on the belt 11 being clamped in correct positions by contact clamps 13, an operator being stationed on the side opposite the shield board for clamping new discs and removing those which already have been sprayed.

The arms 17 are turned in positions corresponding to sectors "A", "B" etc., the shield 5 is locked in its operative position by means of the hook 21, and the graphite composition is applied to these sectors through the apertures 6, 7 and 8 by means of a portable sprayer operated by compressed air. The spraying continues until the respective ohmmeters 9 register the desired resistances for the sprayed sectors. The belt 11 is then moved so as to bring the new set of discs under the shield.

When the sectors are sprayed separately as shown, the belt may be moved for one space at a time and the cumulative resistance is measured for each succeeding position as shown in Fig. 4. For instance, after the first disc is sprayed until the desired resistance is measured or registered, the belt is moved one space bringing the already sprayed disc under the second aperture 7 where the second sector is sprayed, the second ohmmeter registering the combined resistance for both sectors, etc.

The finished articles are shown in Figs. 1 and 2. When made on my machine by my spraying method, these elements are alike in all particulars, each sector being of the same total and specific (for unit length) resistance. The process is very rapid, as it is not necessary to wait until each layer is dry for measuring its resistance.

I claim as my invention:

1. In a machine for making resistance elements, the combination with an endless belt stretched between rollers, of a plurality of resilient clips at one side of said belt adapted to hold insulation discs for resistance elements, a shield in front of said belt and parallel thereto, said shield being provided with a plurality of apertures for permitting spraying resistance composition on said discs, said apertures forming successive portions of an open ring, sliding contact members on said shield adapted to touch the beginning and the end of each sprayed section on said disc, and means to measure the electrical resistance of said sprayed sections between said contact members.

2. In a machine for making resistance elements, the combination with a movable belt, of a shield in front of said belt and parallel thereto, said shield being provided with a plurality of apertures forming portions of an open ring, a plurality of clips on said belt adapted to hold insulation discs for resistance elements, stationary contact members adapted to touch said clips when said discs on said belt are brought successively in opposition to said apertures for permitting spraying the resistance composition on said discs, said contact members forming one end of a circuit comprising a source of electric current and a resistance meter, and a second set of contact members adapted to touch the end portions of each sprayed layer and forming the other end of said circuit.

3. In a machine for making resistance elements, the combination with a movable belt, of a shield in front of said belt and parallel thereto, said shield being provided with a plurality of apertures forming successive portions of an open ring, a plurality of clips on said belt adapted to hold insulation discs for resistance elements, said discs being adapted to be brought on said belt in front of said apertures for permitting spraying resistance layers on said discs through said apertures, resilient contact members in coordination with said apertures adapted to touch the beginning and the end of each sprayed resistance section, and means to measure the electrical resistance of each section between said contact members.

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