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ELECTRONIC COMPUTER CONTACT AND PROCESS OF MAKING SAME

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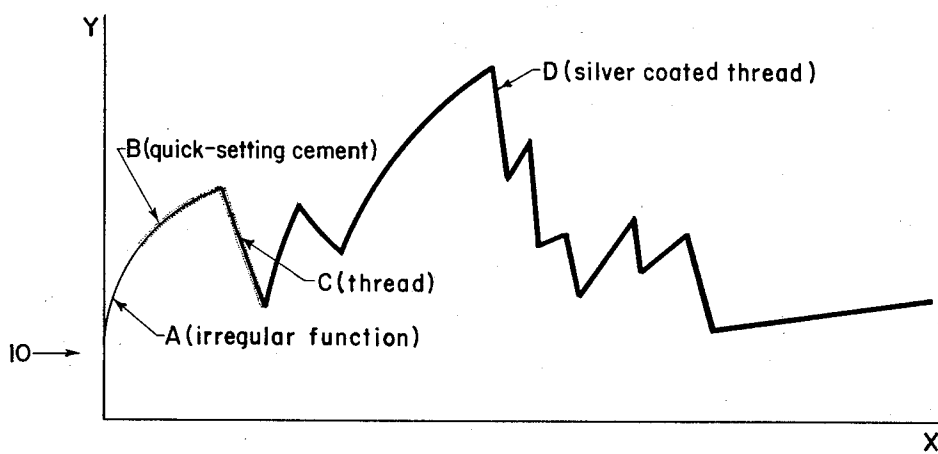


Fig. 1

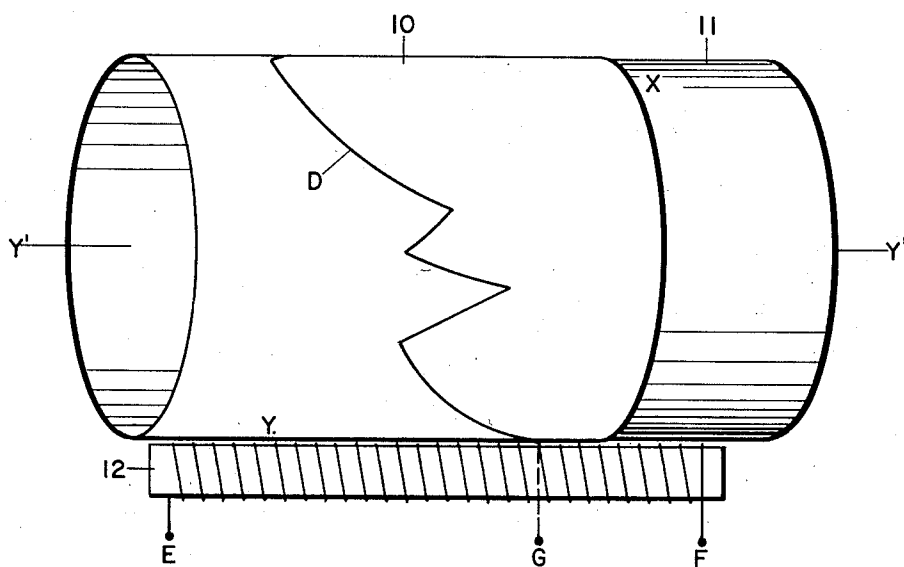


Fig. 2

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ELECTRONIC COMPUTER CONTACT AND PROCESS OF MAKING SAME

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5 Claims. (Cl. 201—48)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to a novel process for applying an electrically conductive curve representing a function, particularly an irregular function, to a sheet of thin flexible material such as paper, the resulting article being especially adapted for utilization on the rotating drum of an electronic computer device.

Electronic computer devices have recently been developed which are particularly useful for solving complicated mathematical equations. One of these devices is the Reeves Electronic Analogue Computer, known as "REAC," of the Reeves Instrument Corporation. In the operation of this device a sheet of paper on which is located an electrically conductive curve representing a function to be generated into the device is wound around a drum. The drum is rotated and during its rotation a fixed electrical resistance element across which is impressed an electric voltage makes continuous contact with the curve. The resulting output voltage expresses the function represented by the curve in terms of electrical quantities varying in accordance with the plotted function.

According to present practice a curve representing the function to be generated into an electronic computer device such as the "REAC" is plotted on graph paper and a metal, e. g. Nichrome, wire is then cemented to the paper following the curve. The paper containing the electrically conductive curve is then fitted to the drum of the input-output table of the computer device. However, where an irregular function such as that illustrated in Fig. 1 of the drawing is to be generated by this equipment, because of the stiffness of the metal wire to be cemented on the paper along the curve representing this function, it is a difficult and time consuming task to bend the wire to follow the irregular contour of the curve. Further, even after such a metal wire is cemented to the paper along the curve, the wire tends to pop away from the paper after the latter has been wrapped around the drum of the computer device.

One object of the invention is the provision of a novel process for feeding functions into an electronic computer device more efficiently, accurately and with greater ease than by present methods.

Another object is to provide novel procedure for the application of an electrically conductive curve representing an irregular arbitrary or mathematical function to a sheet of paper or other thin flexible material, for attachment thereof to the input-output drum of an electronic computer.

Yet another object of this invention is to provide a novel and inexpensive process for applying an electrically conducting irregular curve representing an irregular function to the circular drum of an electronic computer for generation of such function therein, while avoiding the difficulties noted above.

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Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing wherein:

Fig. 1 illustrates an irregular function and the method of applying a conductive curve thereto according to the invention, and

Fig. 2 is a schematic representation of the manner in which a conductive curve corresponding to a function to be generated is incorporated into a computer device.

Briefly, the foregoing objects are accomplished by first applying an adhesive, preferably a quick-setting cement, along a curve which represents a function plotted on a sheet of thin flexible material, generally paper. A flexible fiber or thread is then placed over the adhesive along the curve and the fiber coated with an electrically conductive substance of relatively low resistance. The coating is then dried and the sheet or paper with the electrically conductive curve affixed to its surface is placed over the periphery of the circular drum of a computer device.

In carrying out the invention, an irregular curve corresponding to the function to be generated in the computer device, is plotted on paper or other like thin flexible material such as plastic. A quick-setting or quick-drying cement having strong adhesive properties such as that consisting essentially of a mixture of alkyl resin, nitrocellulose solution, solvent and plasticizer, is applied, as by brushing, along the curve. It is understood, of course, that other types of cement may also be employed. While the cement is in a tacky condition, a thread of a flexible and limp non-conductive material such as cotton, rayon or nylon is placed over the cement along the outline of the curve.

The thread which is now cemented to the paper or other material is coated with a fluid or paint containing an electrically conductive metallic substance. Illustrative of conductive fluids of the type contemplated are fluid suspensions or solutions containing particles of silver or copper, or mixtures thereof. The cement and the metallic coating are allowed to dry and the paper having the metallic conductive curve attached thereto is wrapped around the drum of the computer device.

In a specific example of the invention described in relation to Figs. 1 and 2 of the drawing, an irregular curve A, as shown in Fig. 1, representing a complicated function to be generated in a Reeves Electronic Analogue Computer, is plotted on graph paper along a set of coordinate X and Y axes. A strongly adhering quick-setting cement B is then applied along the curve for stretches of two or three inches at a time, during which period a cotton non-twist thread C is laid over the tacky cement along the exact outline of the curve. After the thread has been cemented over the entire curve, two coats of a silver conducting paint are applied to the thread with a small camels hair brush. The graph is then permitted to dry for twenty-four hours, after which the resistance offered by the resulting conductive curve D in a particular instance is approximately 0.230 ohms per linear inch. The longer the conducting paint is allowed to dry, the less resistance it will offer.

After drying for the desired period, the graph or chart containing thereon the electrically conductive curve D represented in Fig. 1 is fitted around the periphery of the rotatable drum 11, illustrated in Fig. 2, of the input-output table of the Reeves computer device, with the Y axis of the graph located parallel to the axis of rotation Y' of the drum. As the drum 11 is made to rotate by suitable drive means (not shown) a fixed electrical resistance element or resistance card 12 rubs lightly against the conductive curve D.

A fixed input voltage is applied across the fixed points

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E and F at the opposite ends of the resistance card 12, and a varying output voltage across points E and G is developed as the values of Y are picked off the conductive curve during rotation of the drum, point G following curve D and having different positions along the Y axis as the drum rotates. Thus, an irregular function represented by curve D is generated in the computer device in terms of electrical quantities, and enables the quick solution by such device of complicated problems involving the function so generated.

More than 100 runs or problems were carried out on a conductive curve similar to curve D utilizing the Reeves computer device with very little sign of wear on the metal coating of the curve due to contact with resistance element 12. Further, no sign of clogging of the resistance element with particles of silver from the coating was detected. The error due to resistance of such a conductive curve is estimated to be no greater than .05%.

From the foregoing, it is apparent that the invention affords an efficient method for generating rapidly changing or irregular functions into an electronic computer device. The use of a flexible fiber or thread enables it to be readily laid along the curve representing the mathematical function to be generated, and avoids the difficulty of tracking the curve with the much stiffer metal wire formerly employed. The metal, e. g. silver, coated fiber or thread, according to the invention, is about equally as conductive as the corresponding wire. Further, there is considerably less tendency of the metal coated thread of the invention popping away from the sheet to which it is affixed after the sheet has been fitted about the drum of an electronic computer device, then in the case of the stiff wire employed in present practice. Also, the resistance element of the computer follows the metal coated thread with much less friction than in the case of the metal wire presently in use, giving much less noise in the output.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

I claim:

1. The process of making an electrically conductive curve chart which comprises applying an adhesive along a curve representing a function plotted on a sheet of material, placing a flexible and limp fiber on said adhesive along said curve while the adhesive is in a tacky condition and coating said fiber with an electrically conductive substance of relatively low resistance.

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2. The process of making an electrically conductive curve chart which comprises applying a quick-setting cement along a curve representing a function plotted on paper, placing a flexible and limp nonconductive fiber on said cement along the outline of said curve while the cement is in a tacky condition, coating the top surface of said fiber with a conductive metallic substance and drying said coating.

3. The process of making an electrically conductive curve chart representing a function for use in an electronic computer, which comprises plotting a curve representing a function on a base material, applying a quick-setting cement along said curve representing a function plotted on paper, placing a flexible thread on said cement along the outline of said curve while the cement is in a tacky condition, coating the top surface of said thread with a fluid containing and electrically conductive metallic substance, and drying said coating.

4. The process of making an electrically conductive curve chart representing an irregular function for a circular drum of an electronic computer, which comprises plotting an irregular curve representing a function on a sheet of paper, applying a quick-setting cement along said curve, placing a flexible and limp nonconductive thread over said cement along substantially the exact outline of said curve while the cement is in a tacky condition, coating the top surface of said thread with a silver conducting paint, and drying said cement and said coating.

5. An article of manufacture comprising a base member on which is plotted a curve, a flexible and limp fiber member adhesively secured to only one side of said sheet coextensive with said curve, the top surface of the fiber member being coated with an electrically conductive material and extending sufficiently above the surface of the sheet to provide an electrical point contact.

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