

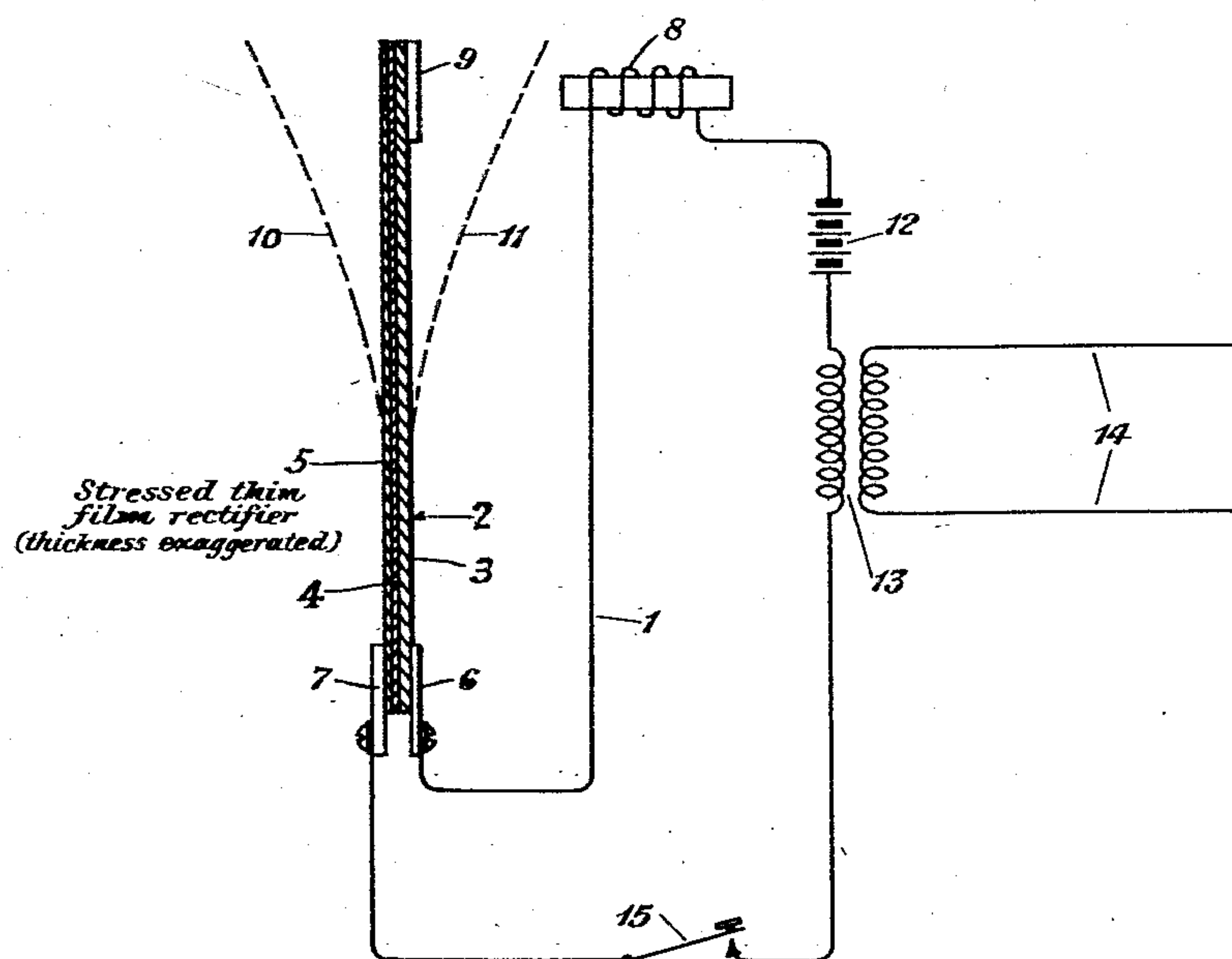
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OSCILLATION GENERATOR

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OSCILLATION GENERATOR

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This invention relates to a method of and means for varying the impedance of an element and more particularly to the utilization of such principles and apparatus as an oscillation generator.

In the operation of the arrangements of the invention, a device such as a thin film rectifier, for example, a disk of copper and cuprous oxide, is included in a circuit and subjected to external stress. It has been found that subjecting a device of this character to stress will vary its impedance in the circuit. In accordance with the arrangements of this invention, the stress to which the device is subjected is caused by utilizing it as a vibrating reed armature under control of a relay in circuit therewith. Under such conditions, the impedance in the circuit may be constantly varied and the device may be utilized as an oscillation generator. Other objects and features of the invention will appear more fully from the detailed description thereof hereinafter given.

For purposes of illustration, it will be assumed that the element whose impedance is to be varied by the method of this invention, may be a rectifier of the well known copper oxide type. However, other types of thin film or contact rectifiers may be utilized. One of the suitable methods of forming the rectifier element might consist in heating a copper sheet about .005" thick to over 1000° C. until a thin closely adherent layer of cuprous oxide about one or two thousandths of an inch is formed. A heat treatment is then administered at lower temperatures. The outer surface of the oxide may then be reduced to metallic copper by electrolysis. The impedance element in the circuit might be formed of one or more of such units.

At the junction of the bulk of the cuprous oxide and the mother copper there is believed to be a transition layer, wherein the copper oxide crystals match perfectly the copper crystals which they adjoin. This transition layer is of high resistivity but in formation, is made to match on to the copper in such a way (probably with considerable stress in the transition layer) as to reduce to a low value the work function of escape into it of

electrons from the copper. However, it matches on to the adjoining cuprous oxide in such a way as to make a large work function. There is no such effect between the thin metallic copper on the outer surface of the oxide as between the mother copper and the oxide due to the different manner in which it is formed. Based on the theory of a transition layer depending upon initial stresses or on substantially perfectly matched crystals, it is proposed in accordance with the principles of this invention, to vary the stresses in this transition layer or the manner in which the crystals are matched and thus vary the work functions. Inasmuch as the oxide and surface coating of copper are very thin, the transition layer is near the surface of the rectifier plate and is subject to approximately the maximum fibre stresses existing in the plate when it is flexed. Furthermore, when a portion of the plate bends in one direction, the transition layer has tension stresses superimposed on the initial stresses, and when bent the other way, has compression stresses added to it. It has been found by experiment that bending a plate so that the oxide is placed in tension instantly increases the resistance in the reverse direction and that when placed in compression, the opposite occurs. It has also been found that variations in pressure cause variations in resistance in the conducting direction. Also, if kept within proper limits, it appears that this flexure can be continued indefinitely without deterioration of the disks.

The invention may be more fully understood from the following description, together with the accompanying drawing in the figure of which is shown a circuit diagram embodying the invention.

In the drawing is shown a circuit 1 having included therein a switch 15, the winding of a transformer 13, a source of energy 12, a magnet 8, and a stressed thin film rectifier disk 2. This rectifier disk has had its thickness exaggerated in the drawing for purposes of illustration and may be composed of a copper portion 3, and oxide film 4 and a surface flash of copper 5. Other metals than copper might be utilized in the construction

of the rectifier disk however. The disk is held by two support members 6 and 7, which are in contact with different sides of the disk and are connected to the line. At or near the extremity of the disk and in proximity to the pole piece of magnet 8, is an armature 9 affixed to the end of the disk. When the switch 15 is closed, the magnet 8 is energized through the rectifier disk 2 and attracts the magnetic armature 9 on the end of the disk. This will bend the disk over to the position indicated by the dotted line 10. This bending of the disk will increase the rectifier resistance and hence decrease the pull of the magnet on armature 9. Accordingly, the disk will swing back to the position shown by dotted line 11. This bending or stressing of the disk in the other direction will decrease the rectifier resistance, thus increasing the current in the circuit and the pull of the magnet and the disk will swing back again. In other words, the disk will swing back and forth like a vibrating reed and the stresses to which it is subjected in bending in each direction will increase and decrease the resistance and the direct current flow in the circuit 1. These changes in the direct current induce an alternating current voltage in the secondary of transformer 13.

An oscillator constructed on the above principles has the advantage of constancy of frequency with smoothness of wave shape, combined with low first and maintenance cost. It is pointed out that the output circuit will produce alternating current corresponding in frequency to the period of vibration of the rectifier disk and that this is capable of adjustment.

While the invention has been disclosed as embodied in certain specific arrangements which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. A circuit comprising a source of current and a magnet, a stressed thin film rectifier disk included in said circuit, said disk being firmly fastened at one extremity and having its other extremity so related with respect to said magnet that it will be caused to vibrate thereby thus varying the stress to which it is subjected and its relative impedance in said circuit.

2. An oscillation generator comprising a circuit including a source of current and a magnet, a stressed thin film rectifier disk included in said circuit and being firmly fastened at one extremity and having its other extremity so positioned with respect to said magnet that it will be caused to vibrate thereby thus varying the stress to which it is subjected and its relative impedance in said circuit.

cuit, and an output circuit connected to said circuit.

In testimony whereof, I have signed my name to this specification this 11th day of May 1929.

WILLIAM H. EDWARDS.

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