

[54] **INSTALLATION FOR CASTING
MICROWIRE IN GLASS INSULATION**

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[30] **Foreign Application Priority Data**

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[58] Field of Search. 219/10.75, 10.77; 331/177 R, 331/60, 117, 167-171

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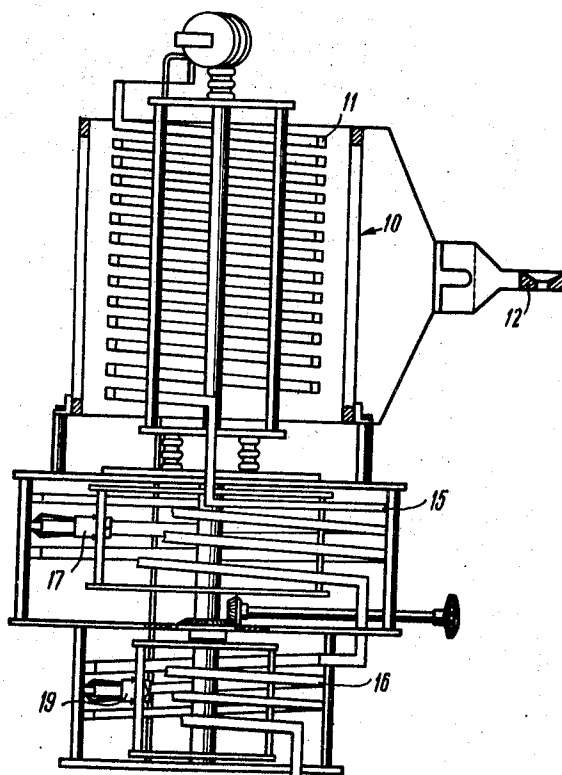
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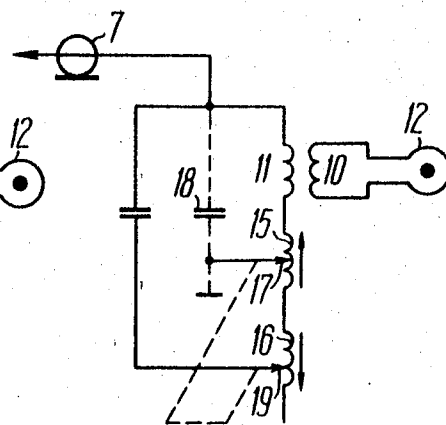
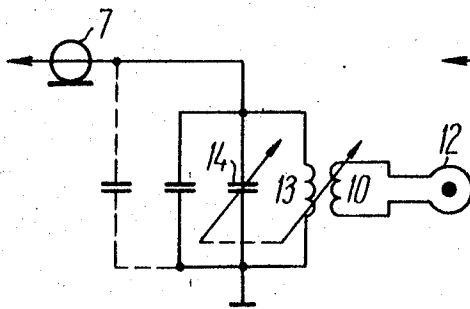
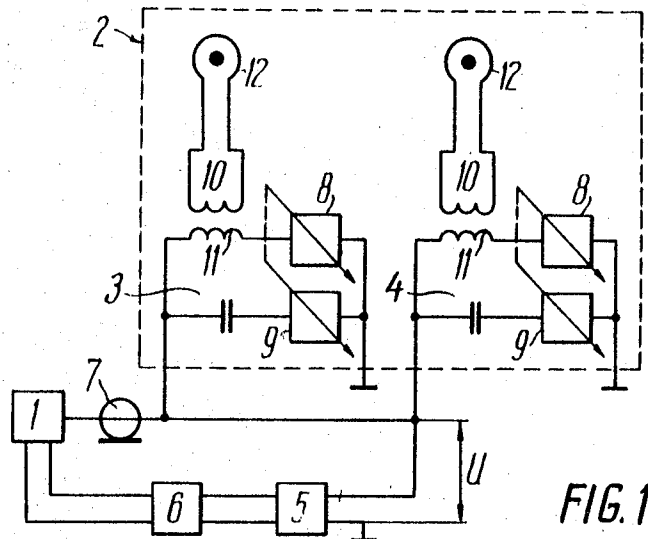
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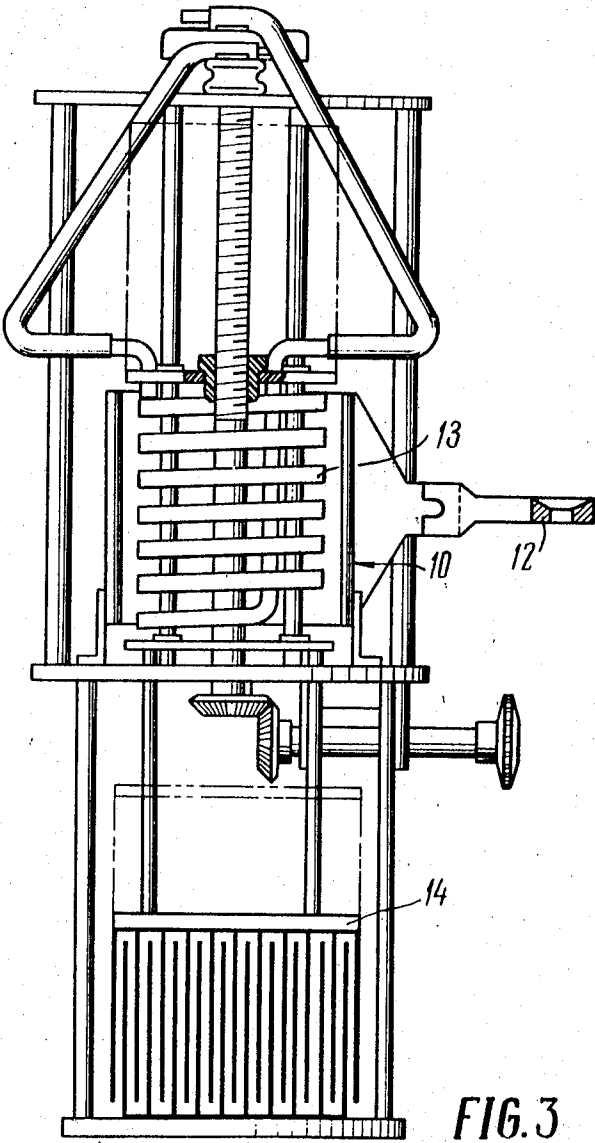
[57] **ABSTRACT**

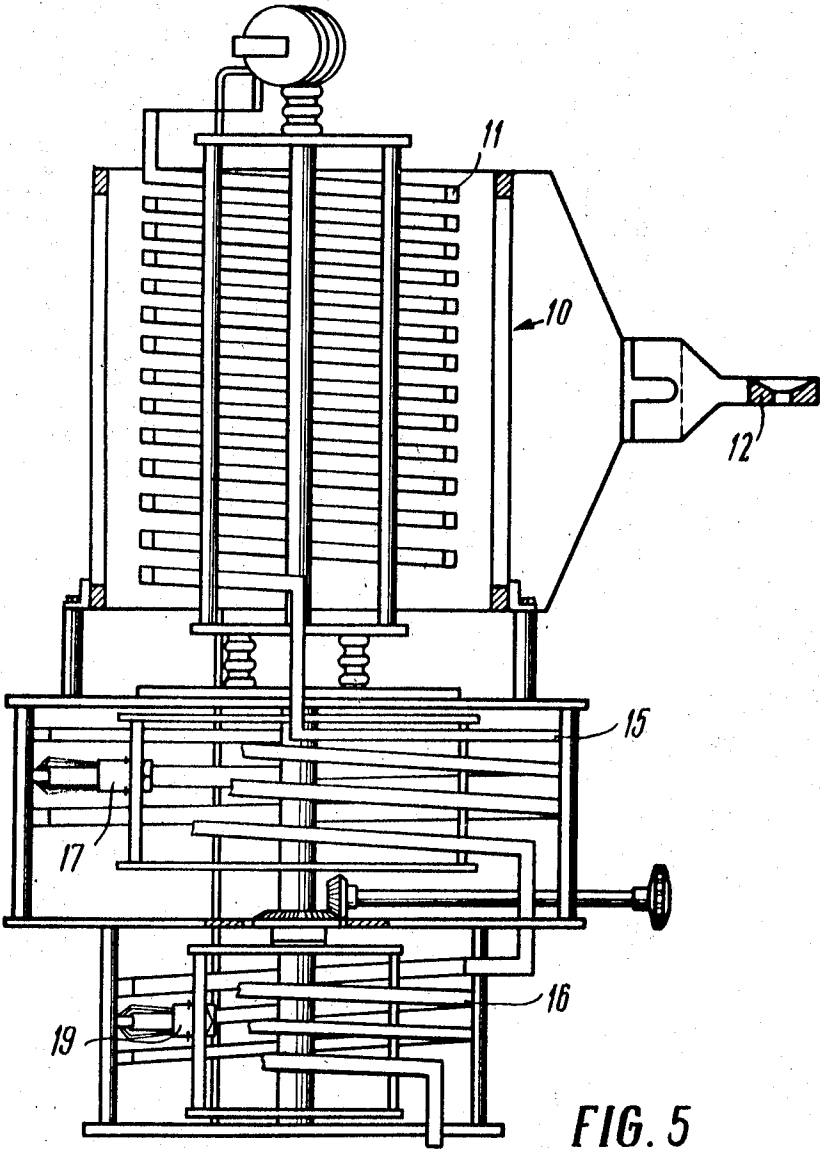
An installation for casting microwire in glass insulation with the aid of a high-frequency inductor whose oscillating system comprises at least two oscillating tank circuits with voltage stabilization; each oscillating tank circuit contains an element for regulating the equivalent or resonance impedance of the circuit and an element for stabilization of the resonant frequency or frequency of generation of the tank circuit synchronously coupled to it. The element for regulating the equivalent or resonance impedance of the circuit is designed in the form of a variable inductance coil, while the element for stabilization of the resonant frequency or frequency of generation of the tank circuit is designed either in the form of a variable capacitor or a variable inductance coil, the movable parts of the two elements being mechanically connected to one another.

3 Claims, 5 Drawing Figures









INSTALLATION FOR CASTING MICROWIRE IN GLASS INSULATION

The present invention relates to the field of micrometallurgy, and more particularly to the installations for casting microwire in glass insulation directly from the liquid phase of metals, alloys or semiconductor materials.

Known in the prior art are installations for casting microwires in glass insulation, comprising a high-frequency generator for induction heating with an oscillating system divided into two separate oscillating tank circuits whose high-frequency power is transmitted to high-frequency inductors which ensure the carrying out of the production process of microwire casting.

Disadvantages of the known microwire casting installations are, firstly, considerable mutual influence of the power conditions of work of the oscillating circuits (and, consequently, the operating conditions of the high-frequency inductors), as a result of which upon the simultaneous preparation of microwire in the inductors, the geometrical and electrophysical parameters of the wire will not be stable, and, secondly, the absence of independent control of the power conditions of the tank circuits does not make it possible to simultaneously prepare in the inductors microwire made from different materials and having different geometrical, electrical and physical parameters.

An object of the present invention is to eliminate the above disadvantages.

The main object of the present invention is to provide such an installation for casting microwire in glass insulation which will make possible the independent operation of at least two oscillating tank circuits and the separate regulation of their power conditions.

This object is accomplished by using a design of an installation for the casting of microwire in glass insulation with the aid of a high-frequency inductor whose oscillating system comprises at least two independent oscillating tank circuits with voltage stabilization, in which, according to the invention, each oscillating tank circuit contains an element for regulation of the equivalent or resonance impedance of the tank circuit and an element synchronously coupled to it for stabilization of the resonant frequency or frequency of generation of the circuit.

It is preferable that the element for regulating the equivalent or resonance impedance of the tank circuit and the element synchronously connected to it for stabilization of the resonant frequency or frequency of generation of the circuit be in the form of a variable inductance coil and a variable capacitor respectively whose movable parts are mechanically coupled.

It is also preferable that the element for stabilization of the resonant frequency of the circuit and the element synchronously connected to it for changing the equivalent or resonance impedance of the tank circuit be in the form of variable inductance coils with movable contacts, coupled in series with the elements of the said oscillating tank circuit, and mechanically couple their movable contacts with one another.

The proposed installation is universal, highly effective from a technical and economical standpoint and advantageously differs from known installations with oscillating systems consisting both of one and of two oscillating tank circuits.

The installation makes it possible to cast either several microwires (in accordance with the number of oscillating circuits) or one wire (if the remaining circuits are disconnected or faulty). This considerably improves the reliability of operation of the installation, since it makes it possible to keep oscillating tank circuits of the system in reserve.

The independency of the power conditions of the oscillating tank circuits makes it possible to simultaneously cast at least two microwires with identical and stable parameters.

The installation ensures smooth independent regulation of the power conditions of the tank circuits within a range from 50 to 100 percent of the rated power, which makes it possible to simultaneously produce microwire from different materials with different geometrical, electrical and physical parameters.

The installation is not sensitive to changes in the voltage of the supply mains within the limits of ± 15 percent and ensures stabilization of the voltage feeding the inductors with an accuracy of ± 1 percent.

The installation provides for smooth manual regulation of the power of the oscillating system within the limits from 0 to 100 percent of the rated power, which makes it possible to set the value of the power depending on the melting point of the material forming a strand of the microwire.

The economical effect of the installation consists in the sharp increase in the yield of high-quality microwire, the economy in electric power and the possibility of simultaneously producing a wide range of microwire on one installation.

The nature of the present invention will become more fully apparent from a consideration of the following description of an exemplary embodiment thereof, taken in conjunction with the accompanying drawings, in which:

FIG. 1 represents a functional diagram of the installation according to the present invention;

FIG. 2 is a schematic electrical diagram of one oscillating tank circuit of the system with a movable tank circuit coil used as the element for regulating the equivalent or resonance impedance, and with the element ensuring the constancy of the resonant frequency or frequency of generation in the form of a variable capacitor;

FIG. 3 shows the design of an oscillating tank circuit conforming to the schematic diagram of FIG. 2;

FIG. 4 is a schematic electrical diagram of one oscillating tank circuit of a system wherein the capacity of the two elements is filled by two variable inductance coils connected in series with each other and the elements of the tank circuit;

FIG. 5 shows the design of an oscillating circuit conforming to the schematic diagram of FIG. 4.

The installation for the casting of microwire in glass insulation comprises nonlinear element 1 (FIG. 1) with feedback circuits electrically connected by oscillating system 2. System 2 has two independent oscillating tank circuits 3 and 4; device 5 for stabilizing the high voltage U across the oscillating system 2 and acting on controlled high-voltage rectifier 6.

Tank circuits 3 and 4 are connected parallel to each other and are connected to nonlinear element 1 by means of coaxial cable 7.

The resonant frequency of each of the tank circuits 3 and 4 and of the entire oscillating system is identical, and for this reason when the number of simultaneously connected tank circuits is changed, the resonant frequency of the oscillating system and, consequently, the generated frequency, do not change.

Each of the oscillating tank circuits includes elements 8 for regulating the equivalent or resonance impedance of the tank circuit and, consequently, the power conditions of the tank circuits, and element 9 for stabilization of the resonant frequency, or frequency of generation which maintains constancy of the resonant frequency or frequency of generation of the circuits and of the entire oscillating system 2. Elements 8 and 9 are synchronously coupled to each other.

The high-frequency oscillations generated in system 2 are transmitted to output circuits consisting of single-turn coils 10 inductively coupled to coils 11 and connected in series to melting inductors 12. When the voltage U across oscillating system 2 is stabilized, a change in the equivalent or resonance impedance of one of the circuits causes a change in the current in this tank circuit and, consequently, in the operating conditions of the corresponding high-frequency inductor 12; the total current feeding the oscillating system will also change. Due to the constancy of the voltage U, however, the operating conditions of the remaining tank circuits will not change if their equivalent or resonance impedances of the tank circuit remain constant.

The equivalent or resonance impedance of an oscillating tank circuit is regulated by means of element 8, and since here the resonant frequency of the tank circuit changes (and, consequently, the generated frequency), synchronously with element 8 there is coupled element 9 which maintains a constant

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resonant frequency or frequency of generation of the tank circuits when the equivalent or resonance impedance changes.

FIG. 2 shows a schematic diagram, and FIG. 3 the design of one embodiment of an oscillating tank circuit (circuits 3 and 4 are identical), in which the capacity of element 8 regulating the equivalent or resonance impedance of the circuit is filled by coil 13 which is movable with respect to single-turn output coil 10. When coil 13 moves out of coil 10 the magnetic connection between them is reduced and, consequently, the power transmitted to coil 10, and, due to the change in the active impedance introduced by the output circuit into the oscillating tank circuit, the equivalent or resonance impedance of the circuit decreases.

At the same time, due to the reduction in the demagnetizing effect of coil 10, the inductance of coil 13 increases.

To maintain a constant resonant frequency or frequency of generation of an oscillating tank circuit, movable coil 13 is rigidly connected to movable plates of capacitor 14 by means of a variable inductance connected in parallel to the oscillating tank circuit. When coil 13 moves out from coil 10, the capacity of capacitor 14 synchronously is reduced according to the relevant law, and as a result the resonant frequency or frequency of generation of the oscillating tank circuit remains constant. Capacitor 14 is the element for maintaining a constant resonant frequency or frequency of generation of the circuit (element 9 in FIG. 1).

FIG. 4 shows a schematic diagram, and FIG. 5 the design of a second embodiment of an oscillating tank circuit (circuits 3 and 4 are identical). Here the capacity of both regulating elements is filled by two additional variable inductance coils 15 and 16 connected to each other and to coil 11 in series.

When the position of probe 17 on coil 15 is changed, the circuit connection coefficient changes, as well as the equivalent or resonance impedance of the tank circuit and the operating conditions of inductor 12. The influence of the self-capacitance 18 of cable 7 also changes. As a result the resonant frequency or frequency of generation of the tank circuit

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changes. The connection of coil 16, whose probe 19 is mechanically connected to probe 17, makes it possible to ensure constancy of the resonant frequency or frequency of generation, both probes 17 and 19 synchronously moving along the turns of coils 15 and 16 in different directions. When the coupling coefficient increases (probe 17 moves downward) the influence of capacitance 18 increases and the frequency of the circuit decreases; probe 19 synchronously moves upward, reducing the total inductance of the tank circuit and thus ensuring a constant value of its resonant frequency and the resonant frequency or frequency of generation of oscillating system 2 (FIG. 1).

We claim:

1. In combination, apparatus for casting microwire in glass insulation comprising a high-frequency inductor; a power source; an oscillating system comprising at least two separate and independent oscillating tank circuits with high-frequency voltage stabilization; an element for regulating the equivalent impedance of said tank circuits; an element for stabilizing the resonant frequency of said tank circuits synchronously coupled to the said element for regulating the equivalent impedance of the tank circuits, said power source connected to said oscillating system.

2. A combination according to claim 1, in which the said element for regulating the equivalent impedance of the circuits and the said element synchronously coupled to it and serving for stabilization of the resonant frequency of the circuit are a variable inductance coil and a variable capacitor, respectively, whose movable parts are mechanically connected.

3. A combination according to claim 1, in which the said element for regulating the equivalent impedance of the circuits and the said element synchronously connected to it and serving for stabilization of the resonant frequency of the circuit are variable inductance coils with movable contacts connected in series to the oscillating tank circuit, their movable contacts being mechanically connected to one another.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,651,301 Dated March 21, 1972

Inventor(s) Leonid Petrovich Menchikov et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet cancel "[73] Assignee: The National Cash Register Company, Dayton, Ohio".

Signed and sealed this 26th day of November 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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