Aug. 7, 1928. 1,679,487

W. MEYER

ELECTRIC CURRENT SYSTEM

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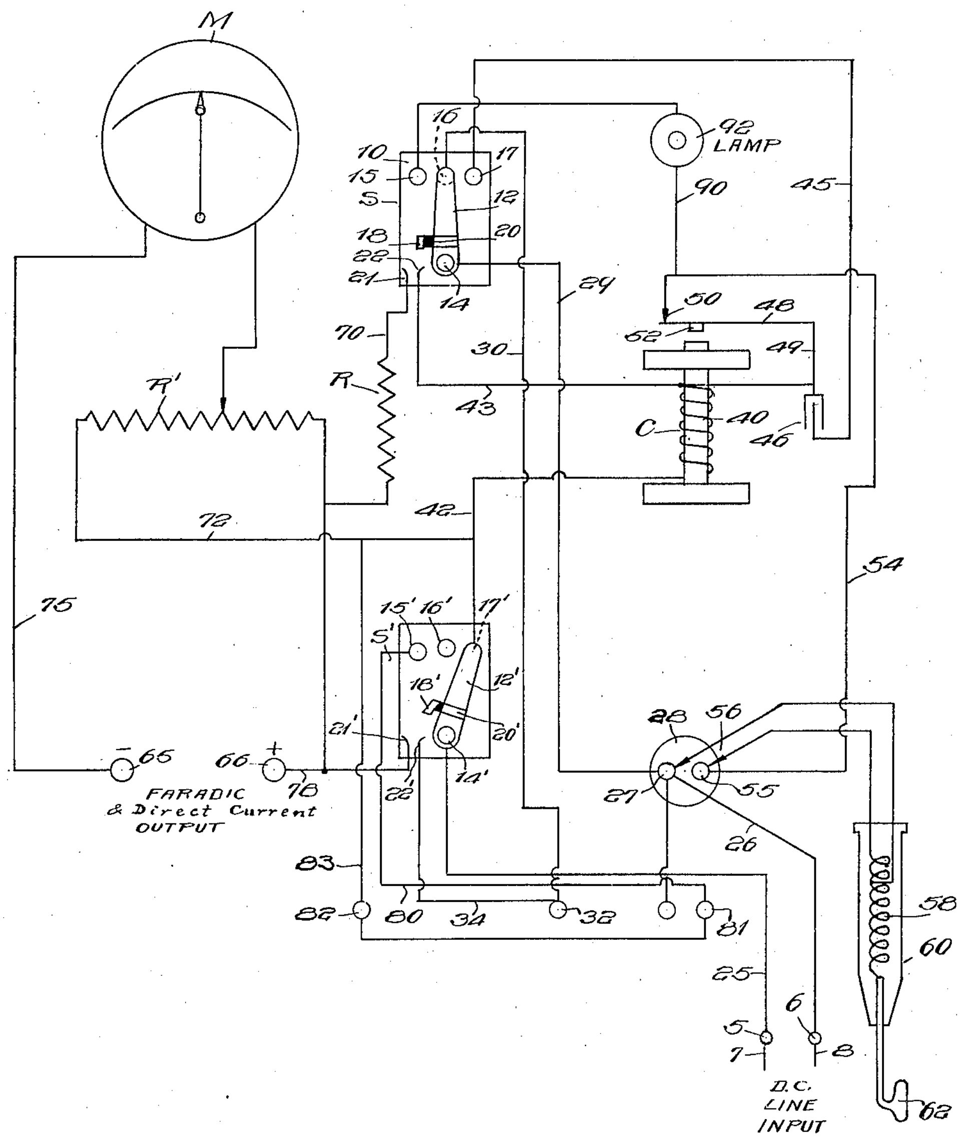
Fig. 1.



Witnesses:
William P. Kilroy
Harry R. Lechute

Inventor:
William Meyer
By Brown Boettcher Dienner
Attys

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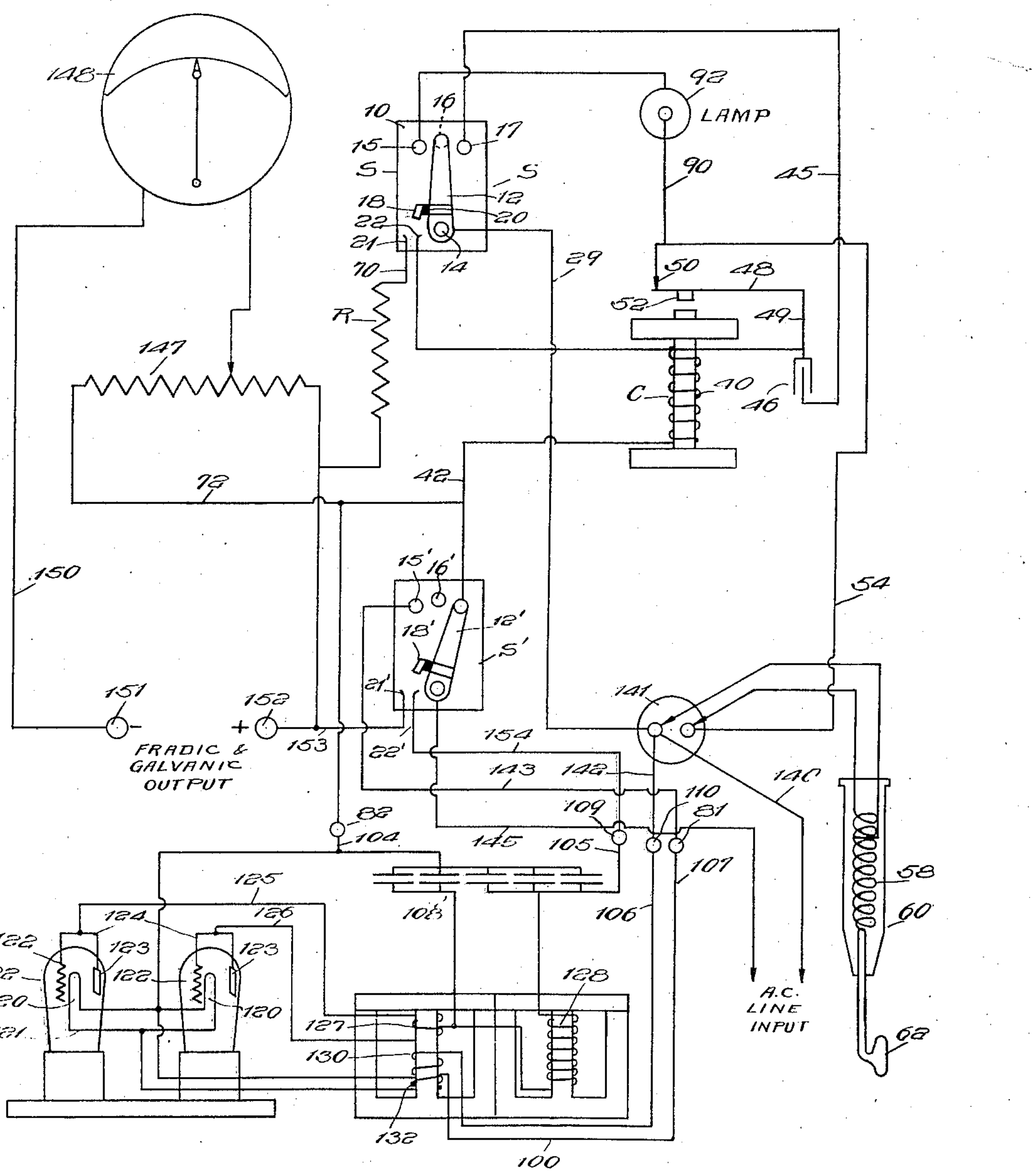
Fig. 2.



Witnesses:
William P. Kilroy
Harry R. L. White

Inventor:
William Meyer

By Brown Boettcher & Dienner Att'ys

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UNITED STATES PATENT OFFICE.

WILLIAM MEYER, OF CHICAGO, ILLINOIS.

ELECTRIC-CURRENT SYSTEM.

Application filed July 31, 1925. Serial No. 47,182.

This invention relates to electrotherapeutics and more particularly to an improved electric current system therefor.

The use of induced current, high frequency current and galvanic current for electrothermic and electrotherapeutic uses is well understood in the art and it is the object of my present invention to provide a generally improved and simplified system for applying any of the foregoing currents selectively to any of the uses to which they are suitable or desirable such as to treat diseases, destroy cells, promote stimulation, remove growths or for any other treatment or use.

A further object is to provide a system which may be used for this purpose in a simple and expeditious manner and without especial skill on the part of the operator and a system that may be economically produced and in which the parts and connections are minimized.

With the foregoing in view, I dispense with the usual induction coil heretofore required for such purposes, in addition to the coil heretofore employed solely for charging the high frequency oscillator, by providing for using this high frequency oscillator coil which is commonly termed, a kick coil, as a common coil or for the dual purpose of charging the high frequency oscillator and for furnishing induced current. I also provide, in conjunction therewith means for selectively applying direct or constant unidirectional current, and the high frequency and induced current, these being of the interrupted or alternating type, as well understood in the art.

I also provide for using either direct or alternating current and where the commercial current is alternating, I provide for rectifying it into a smooth direct current where a direct current is desired.

In order to acquaint those skilled in the art with the nature and manner of practicing my invention, I shall now describe certain embodiments of the same in connection with the accompanying drawings, in which;

Figure 1 is a circuit diagram of a system embodying my invention, and

Figure 2 is a circuit diagram of a rectifying system embodying the invention.

The system shown in Figure 1 is especially adapted for use where the commercial current is direct or uni-directional.

The D. C. line input is illustrated as through the terminal binding posts 5 and 6. The line conductors are illustrated at 7 and 8 and they may lead from any suitable or preferred source.

Interposed in the system are a pair of switches S and S′. The switch S shown as comprising a base 10 having a switch arm 12 pivoted at its terminal end 14 thereon with three contacts 15, 16 and 17 spaced in the path of travel of the outer end of the arm 12 which is adapted to selectively connect the terminal 14 with either of the contacts 15, 16 or 17. The switch S also has a metal contact 18 attached to an insulating arm 20 carried by and swingable with the arm 12, this contact 18, when the switch arm 12 is thrown to the left and into cooperation with the contact 15, bridging and completing a circuit across two spring contacts 21 and 22.

The switch S′ also has a base 10′ and a similar switch arm 12′ pivoted at its terminal end at 14′ and cooperable selectively with contacts 15′, 16′ and 17′. The switch arm 12′ also has a metal contact 18′ attached to an insulating arm 20′ carried by the switch arm 12′ for bridging and completing a circuit across a pair of spring contacts 21′ and 22′.

The input or line terminal or binding post 5 is connected by means of a conductor 25 with the terminal 14′ of the switch S′. The other input or line terminal 6 is connected by means of a conductor 26 with one terminal 27 of a plug connector 28. The terminal 27 is in turn connected by means of a conductor 29 with the terminal 14 of the switch S.

The contact 16 of the switch S is connected by means of a conductor 30 with a terminal binding post 32 which post 32 is in turn connected by means of a conductor 34 with the spring contact 22′ of the switch S′. The contact 16′ of the switch S′ is the "off" position of the arm 12′.

The coil for charging the high frequency oscillator is indicated at C. The coil C is relatively large and is generally of the type commonly termed the "kick" coil of a high frequency circuit. It has the usual or any

preferred core 40. One end of the coil C is connected by means of a conductor 42 with the contact 17′ of the switch S′. The other end of the coil C is connected by means of a conductor 43 with the spring contact 22 of the switch S and by means of a conductor 45 with the contact 17 of the switch S. A condenser 46 is connected in series circuit between the coil C and the contact 17. This end of the coil C is also connected with an interrupter arm 48 by means of a conductor 49. The interrupter arm 48 may be pivoted or sufficiently resilient to swing between contact with the core 40 and with a contact 50, being shown as having a contact 52 for cooperation with the core 40. The contact 50 is connected by means of a conductor 54 with the terminal 55 of the socket connector 28.

Cooperable with the socket connector 28 is a plug connector illustrated diagrammatically at 56, the plug connector 56 being connected with the oscillator coil 58 which may be of the "Tesla" type and enclosed, for example, in the usual manner in a hard rubber or insulating shell 60 which serves as a handle and socket for the high frequency electrode 62.

The output terminals from which the induced and direct current is taken as desired are indicated at 65 and 66.

A conductor 70 connects the spring contact 21 of the switch S with the positive output post or terminal 66 through a relatively fixed comparatively high resistance R, such as for example, a carbon rod or bar to assure proper connection and distribution at all times to the terminal 66 and back to the terminal 6 of the input side when the induction system is in operation. A conductor 72 leads from the conductor 42 between the coil C and the switch S′ and through a variable or adjustable resistance R′, milliammeter M and conductor 75 to the negative output post or terminal 65.

The spring contact 21′ of the switch S′ is connected by means of a conductor 78 with the output post or terminal 66 and the contact 15′ of the switch S′ is connected by means of a conductor 80 through binding posts 81 and 82 and a conductor 83 with the variable resistance R′ and through that resistance and the milliammeter M to the output post 65.

In use, where high frequency applications are desired, the plug 56 is inserted into the jack or socket connector 28 and the switch arms 12 and 12′ are swung into engagement with the contacts 17 and 17′, respectively. The high frequency circuit, including the conductor 25, terminal 14′, switch arm 12′, contact 17′, conductor 42, coil C, condenser 46, conductor 45, contact 17, switch arm 12, terminal 14, conductor 29, socket connector 28 and conductor 26, is thereby closed. The interrupter arm 48 is vibrated into and out of contact with the contact 50, as well understood in the art, and the coil C imparts the desired current impulses in the oscillator circuit. The condenser 46 is in effect connected between the oscillator and coil C circuits of the system.

It is well understood that the patient may thereby be immersed in a field of rapidly oscillated influence, the effect of which may, of course, be adjusted or modified as desired. The extremely low amperage about these currents accounts for the immunity from danger in applying same.

When it is desired to discontinue the high frequency application and to employ a direct current, the plug 56 is withdrawn, the switch arm 12 moved into its intermediate position in contact with the contact 16 and the switch arm 12′ moved to the left into contact with the contact 15′. In moving the switch arm 12′ into contact with the contact 15′, the metal contact 18′ is simultaneously moved into bridging contact with the spring contacts 21′ and 22′.

Thereupon the direct current circuit including conductor 25, terminal 14′, switch arm 12′, contact 15′, conductor 80, terminal posts 81 and 82, conductor 83, variable resistance R′, milliammeter M, conductor 75, terminal post 65 and terminal post 66, conductor 78, spring contacts 21′ and 22′ and metal contact 18′, conductor 34, terminal post 32, conductor 30, contact 16, switch arm 12, terminal 14, conductor 29, connector 28, conductor 26 and terminal 6, is completed.

The direct current is withdrawn or applied from the terminal posts 65 and 66 as well understood in the art, and the effect thereof may be adjusted or varied as desired by adjustment of the resistance R′.

Where induced current is desired with the plug 56 removed or disconnected from the connector 28, the switch arm 12 is swung into contact with the contact 15, the metal contact 18 simultaneously bridging and closing the circuit across the spring contacts 21 and 22. The switch arm 12′ is set in contact with the contact 17′ of the switch S′.

Thereupon the induced current circuit, including the conductor 25, switch arm 12′, conductor 42, coil C, conductor 49, interrupter arm 48, contact 50, conductor 90, telltale and resistance lamp 92, contact 15, switch arm 12, terminal 14, conductor 29, connector 28 and conductor 26 to the terminal member 6, also through conductor 72, variable resistance R′, milliammeter M, conductor 75 and terminal 65 and through conductor 43, contacts 22, 18 and 21, conductor 70, resistance R and terminal 66 is completed. The resistance R is preferably relatively large or high to enable use of the high frequency coil C for this purpose and to

assure and proportion the proper flow through the coil C which, it will now be apparent, serves as the induction coil, whereas in the use first described this same coil C served to charge the high frequency oscillator in the high frequency application.

The coil C thereby serves the dual purpose of charging the high frequency oscillator and furnishing faradic current in a separate circuit by self-induction and the parts and connections of the entire system are minimized. Various of the parts and connections are common to the induction circuit, the high frequency and direct current circuits for which the system is thereby adapted and the system may be used simply and expeditiously without especial skill on the part of the operator which admirably enables its use in the home.

In the induction setting, the lamp 92 offers a certain resistance in the circuit and forms in effect a pilot light and in the induction and direct current settings, the strength of the current may be controlled by adjusting the variable resistance R'.

Where a direct current is wanted and the commercial current is alternating, I provide, as shown in Figure 2, a set of transformers 100 and kenetrons 102 for rectifying the alternating current into a smooth direct current admirably suited to the requirements.

In this system, the induction and high frequency circuits are substantially as described in the previous embodiment of the invention, all parts and connections similar to those in the system of Fig. 1 and not designated by different reference characters being indicated by the same reference characters as employed in Fig. 1.

In the direct current circuit, however, the conductor 30 and the conductor connecting the terminal posts 81 and 82 are omitted. In lieu thereof, the leads 104, 105, 106 and 107 from the kenetrons 102, transformers 100 and condensers 108 are connected to the terminal posts 82, 109, 110 and 81, respectively.

The filaments 120 of the kenetrons are interconnected at 121 and the grid 122 and plate 123 of each kenetron are interconnected at 124. The interconnections 124 are connected by conductors 125 and 126 to opposite sides of a coil 127 wound upon one core portion of the transformer 100. Lead from the coil 127 is connected through the condenser 108 and to a second coil 128 which is, in turn, connected to the condenser 108. A coil 130 is connected across the leads 106 and 107 and a coil 132 is connected at one end to the interconnection 121 and at its opposite end to the lead 104.

In this case, the direct current circuit is closed by leaving the arm of the switch S in its central position and swinging the arm of the switch S' into engagement with contact 15' with the accompanying bridging engagement of contact 18' with spring contacts 21' and 22'. The direct current circuit including conductor 140, connector 141, conductor 142, coil 130, conductor 143, contact 15', switch arm 12' and conductor 145, also a circuit including conductor 146, variable resistance 147, milliameter 148, conductor 150, terminal posts 151 and 152, conductor 153, contacts 21', 18' and 22' and conductor 154, is thereby completed. With an alternating current source, a smooth D. C. current using both alterations is thus provided.

I claim:

1. In an electric current system, the combination of a high frequency circuit, an induction circuit and a common single winding coil for both said circuits, said coil operating as a charging coil in the high frequency circuit and furnishing faradic current in a separate circuit by self-induction.

2. In an electric current system, the combination of a high frequency circuit, an induction circuit, a common single winding coil for both said circuits, and means for selectively completing said circuits through the single winding of said coil.

3. In an electric current system, the combination of a high frequency circuit having an oscillator therein, a single winding coil for charging said oscillator and induction circuit including the single winding of said coil.

4. In an electric current system, the combination of induction circuit including a single winding coil for furnishing induced current and a high frequency circuit including the single winding of said coil.

5. In an electric current system, the combination of a high frequency circuit having an oscillator therein, a single winding coil for charging said oscillator, said coil having an armature arm, a condenser in said circuit for vibrating said arm, an induction circuit adapted to be completed through the single winding of said coil and around said condenser and a resistance in said induction circuit.

6. In an electric current system, the combination of a high frequency circuit, a single winding coil in said circuit, a pair of output terminals, a circuit leading from the single winding of said first circuit on one side of said coil through an adjustable resistance to one of said terminals, a circuit leading from said first circuit on the other side of the single winding of said coil to the other of said terminals, and a relatively large resistance in said last circuit.

7. In an electric current system, the combination of a high frequency circuit, a single winding coil in said circuit, a pair of output terminals, a circuit leading from the single

winding of said first circuit on one side of said coil through an adjustable resistance to one of said terminals, a circuit leading from said first circuit on the other side of the single winding of said coil to the other of said terminals, a relatively large resistance in said last circuit, and means for selectively completing said high frequency and said last two circuits.

8. In an electric current system, the combination of a pair of switches, means for connecting the line conductors thereto, a single winding coil in series circuit between said switches, a high frequency oscillator adapted for connection in circuit therewith, an interrupter for the single winding of said coil, a condenser between the oscillator and coil circuits, a pair of terminals, a circuit leading from the single winding of said coil circuit on one side of said coil to one of said terminals, a variable resistance and indicator in said last circuit, a circuit leading from the single winding of said coil circuit on the other side of said coil to the other terminal, and a relatively high resistance in said last circuit, said switches being operable to selectively complete the coil circuit through the condenser and independently of said last circuit, or with said last circuit and around the condenser.

9. In an electric current system, the combination of a direct current circuit, a high frequency circuit, an induction circuit, a common single winding coil for said induction and high frequency circuits, common terminal means for said induction and direct current circuits, and switch means for selectively completing said circuits.

10. In combination, a high frequency circuit, an induction circuit, a common single winding coil having its single winding connectible through an interrupter with the high frequency circuit for imparting high frequency current impulses therein and connectible with the induction circuit, a condenser connected between the single coil winding and interrupter circuit, the single winding of said coil operating as a charging winding in the high frequency circuit and operating by self-induction to produce an induced current in the induction circuit.

11. In combination, a high frequency circuit, an induction circuit, an interrupter, a common single winding coil having its single winding connectible through said interrupter with the high frequency circuit for imparting high frequency current impulses therein and connectible with the induction circuit, a condenser connected between the single coil winding and interrupter circuits, the single winding of said coil operating as a charging winding in the high frequency circuit and operating by self-induction to produce an induced current in the induction circuit and means for selectively completing said circuits through the single winding of said coil.

In witness whereof, I hereunto subscribe my name this 28th day of July, 1925.

WILLIAM MEYER.