

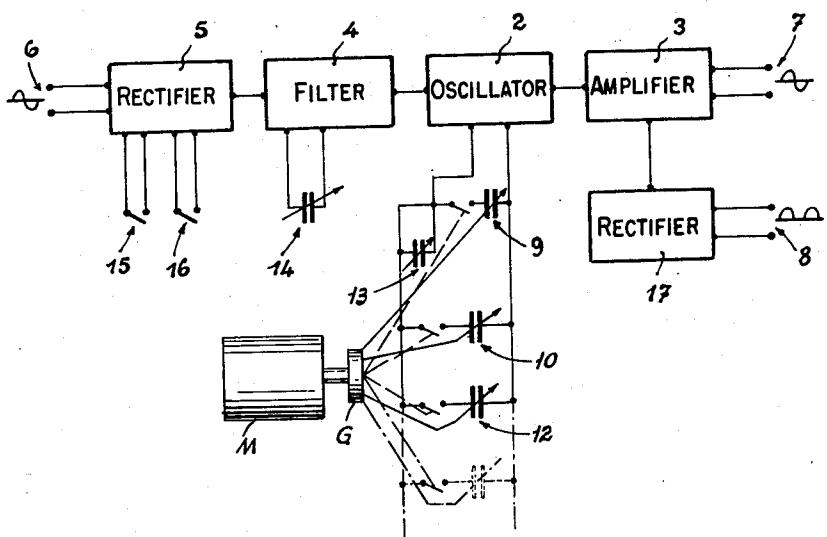
May 17, 1960

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2,936,762

APPLICATION OF MODULATED DECREASING FREQUENCIES TO THE BODY

Filed April 9, 1953



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United States Patent Office

2,936,762

Patented May 17, 1960

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2,936,762

APPLICATION OF MODULATED DECREASING FREQUENCIES TO THE BODY

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Application April 9, 1953, Serial No. 347,701

Claims priority, application France June 5, 1952

3 Claims. (Cl. 128—422)

Various techniques imply the application of alternating currents the frequencies of which range between a few cycles and millions of cycles per second. Physiology which consists in studying the phenomena of life and medical science which forms the diagnosis and defines the treatment of disturbances in such phenomena, resort either to low frequencies which have a sensitive and nerve-governing effect or else to high frequencies which have no such sensorimotor action, so that it is possible to apply them under high intensities with a view to obtaining the desired thermic action.

In contradistinction, the intermediary frequencies which may be termed mean frequencies and range between say 1000 and 100,000 cycles per second have been but little studied and used for medical purposes.

The reason of this fact lies in the absence of any standard apparatus adapted to produce such frequencies and chiefly in the lack of stability of the physiological action of such frequencies; thus the effect on the sensitivity and motivity of the patient are reduced when the frequency rises and increase when the latter sinks. When all other conditions remain the same and for a given uniform and unvarying frequency, the actions on the sensitivity and motivity decrease rapidly by reason of the action of habit when the duration of application increases and this action disappears sometimes completely after a few minutes.

Lastly, certain therapeutic applications may benefit by the simultaneous application of medium frequency and low frequency currents, the association of which has never been proposed hitherto.

On the other hand, it is possible to use generators of frequencies above 50,000 cycles per second for the production of ultra sounds and generators of frequencies ranging between 30 and 5000 or 10,000 cycles per second for the production of sounds. In contradistinction, mean frequencies ranging between 5000 and 50,000 periods per second and corresponding to the transitional zone between sounds and ultra-sounds have been investigated only to a slight extent and are practically not used. Their interest resides however in:

The possibility of defining the threshold between sounds and ultra-sounds, which threshold varies according to the patient and depends on age and various ailments.

The possibility of acting on parts that are particularly sensitive to such frequencies, except as concerns perception through the auditory channels, such as Corti's organs and the labyrinth and therethrough on the nervous system.

My invention has for its object the production of a periodic current submitted to a very slow decrease in frequency between about 50,000 and 5,000 cycles, said decrease lasting between two and ten minutes or thereabouts while at least one modulation of say 10 to 600 cycles is applied to said decreasing frequency.

This is obtained by means of a conventional oscillating system to which I incorporate variable capacities with a view to modifying gradually the frequencies to obtain a final current the shape of which depends on various

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factors, such as the physiological effect to be obtained and also the reduction of intensity of such effects through habit and the physiological sensitivity of the different patients.

5 The physiological effects decrease as a matter of fact with the duration of application for a predetermined frequency and intensity and the benefit of the action at the start is speedily lost, however, as such effects increase when the frequency drops, it is possible to extend the 10 benefit of the initial action by lowering gradually and automatically the frequency from a maximum down to a predetermined minimum.

To this end and in conformity with the present invention, a condenser of variable capacity is connected with a 15 mechanical or electric motor driving the movable parts of the condenser at an adjusted speed in a manner such that the capacity varies between a minimum corresponding to a maximum frequency and a maximum corresponding to a minimum frequency during a lapse of time 20 of 2, 3, 4 . . . 10 minutes or thereabouts.

The physiological action decreasing as a consequence of habit when a predetermined constant frequency is applied continuously, it is possible to benefit according to a further feature of the present invention by a partial 25 break in habit, as provided by intermittent action and more specifically by modifying the frequency in a periodical manner such as a modulation at the rate of say one period per second extending over say 100 cycles. This may be obtained by inserting and cutting periodically a 30 capacity corresponding to the desired modification, in and out of the oscillating circuit, this insertion and cutting out being performed preferably in a sudden manner by means of any suitable automatically and periodically operating switch. It is thus possible to obtain a periodical 35 modification in frequency which is of particular interest with a view to obtaining rapid modifications of a magnitude of 10 to 100 per second.

The modification of this capacity may in contradistinction be a gradual one by reason of the more or less slow 40 shifting with reference to the stationary elements of a variable condenser, of the movable elements carried along by a motor of any description. The periodicity of this modulation depends on the speed of rotation of the movable members, the amplitude of modulation depending on the value of said variable capacity.

45 A delayed habit may also occur for a predetermined type of frequency modulation and it is consequently possible, in accordance with a further feature of my invention, to cut out said habit by superposing two or more different types of modulation having different characteristics as to 50 the periodicity and magnitude of the modulation.

For this purpose, I associate two or more of the above 55 arrangements as disclosed hereinabove so as to produce different modulations; thus for instance, I may superpose on a modulation of 100 cycles per second a periodical modulation which is both slower and of a greater extent, of say 600 cycles every 10 seconds.

The physiological sensitivity to such a predetermined 60 modification or type of modulation of frequency, is furthermore much more important at low frequencies than at high frequencies and it is possible according to my invention to reduce the amplitude of the frequency modulation in conformity with the automatic reduction of the fundamental frequency.

I may use therefor a variable capacity, inserted in 65 series with the capacities submitted to periodical modification with a view to producing modulations in frequency, the movable elements of said variable capacity being submitted to a movement opposed to that of the elements of the precedingly specified condenser, adapted 70 to extend the benefit of the original action. One of the capacities decreases when the other increases and the ac-

tion of the periodical variations of said capacities decreases consequently when the fundamental frequency decreases.

As low frequency currents ranging between about 50 and 100 periods have special physiological effects, it is of interest to benefit by their action in superposition over that of the frequencies of mean value as provided, in particular by proceeding with a modulation of intensities at low frequencies of mean frequency currents.

To this end, in the mean frequency generator, the constant voltage feeding the oscillating tube is replaced, according to my invention, by a pulsatory voltage obtained by the rectification of an alternating current at say 50 or 60 periods, the filtration being cut out or adjusted according to requirements, by modifications in the values of the filtering capacities.

Under such circumstances when a single alternation is used, the mean frequency current intensity is modulated at a frequency of say 50 or 60 cycles and when both rectified alternations are used, the current is modulated at a frequency of 100 or 120 cycles.

It may also be of interest to shift, as required or periodically, the modulation at 50 or 60 periods to a modulation at 100 or 120 periods.

To this end, I provide a hand-operated or automatic periodically operating switch in the rectifying circuit fed with one of the rectified alternations.

It may be lastly of interest to resort to the mean frequency current, whether modulated or otherwise, in its rectified form, in which case a rectifier of the thermionic or copper oxide type is inserted in accordance with the invention beyond the preceedingly described device or devices ahead of the utilization circuit.

I have illustrated by way of example in the single figure of accompanying drawings and by no means in a limiting sense a wiring diagram of a generator feeding mean frequency current in accordance with my invention.

In said figure, 2 designates an oscillator of any suitable type, whether of the coil or of the resistance type, while 3, 4, 5 designate respectively an amplifier, a filter and a rectifier which are also of any known or suitable type and 6 designates the connection between the generator and the A.C. mains, 7 and 8 designating the connections leading towards the utilization circuit at the output of said arrangement, respectively in the case of the use of an alternating current and of the use of a rectified alternating current.

Across the terminals of the oscillator 2 are inserted shuntwise condensers shown respectively at 9, 10, 12 . . . The condenser 9 has a variable capacity, the value of which increases gradually. It is connected with a motor driving its movable elements at an adjusted speed in a manner such that the value of the capacity increases between a minimum corresponding to maximum frequency to a maximum corresponding to minimum frequency in 55 2, 3, 4 . . . 10 minutes e.g.

The condensers 10, 12 . . . have capacities the modifications of which vary by different amounts and at different frequencies and they are inserted and cut out periodically with reference to the capacity of the oscillating circuit. These condensers 10, 12 . . . are inserted in 60

series with a capacity 13, the capacity of which has a gradually decreasing value so as to reduce the amplitude of the frequency modulation, while the fundamental frequency is being reduced by the condenser 9.

5 In addition to the connection of these condensers with the oscillator 2, my improved generator includes: a condenser 14 of variable capacity inserted shuntwise across the terminals of the filter 4; a periodically operating switch 15 inserted in the anode circuit of the rectifier 5; a periodically operating switch 16 inserted in the heating circuit of a tube forming part of the rectifier; a rectifier 17 of the thermionic or copper oxide type, inserted beyond the amplifier 3.

10 Obviously, my invention is by no means limited to the single arrangement of a generator of medium frequency currents disclosed hereinabove by way of example and it covers all the modifications thereof falling within the scope of accompanying claims.

What I claim is:

20 1. A method for treating physiological disturbances consisting in applying to the patient a current at a frequency decreasing gradually between two values lying within the upper and the lower part respectively of a range comprised between 50,000 and 5,000 cycles during a lapse of time selected between about 2 and 10 minutes and simultaneously frequency modulating the decreasing frequency at a rhythm of about 600 cycles per second.

30 2. A method for treating physiological disturbances, consisting in applying to the patient a current of frequencies ranging between about 5,000 and 50,000 periods, and lowering gradually and automatically said frequency between the upper and lower frequency of said range during a lapse of time selected between about two and ten minutes and modulating the said decreasing frequency at a rhythm comprised between about ten and one hundred periods per second.

35 3. A method for treating physiological disturbances, consisting in applying to the patient a current of frequencies ranging between about 5,000 and 50,000 periods, lowering gradually and automatically said frequency between the upper and the lower frequency of said range during a lapse of time selected between about two and ten minutes and modulating the said decreasing frequency at a rhythm comprised between about ten and one hundred periods per second, and modulating it further at a rhythm of about 600 cycles per second.

References Cited in the file of this patent

UNITED STATES PATENTS

| | | | |
|-----------|----------------|-------|---------------|
| 1,992,441 | Purington | ----- | Feb. 26, 1935 |
| 2,099,511 | Ceasar | ----- | Nov. 16, 1937 |
| 2,350,797 | Morland et al. | ----- | June 6, 1944 |
| 2,381,496 | Hansell | ----- | Aug. 7, 1945 |
| 2,434,497 | Kearsley | ----- | Jan. 13, 1948 |
| 2,469,289 | Beard et al. | ----- | May 3, 1949 |
| 2,520,141 | Hardy | ----- | Aug. 29, 1950 |
| 2,545,087 | Hart | ----- | Mar. 13, 1951 |
| 2,590,216 | Schuhfried | ----- | Mar. 25, 1952 |
| 2,779,336 | Abbe | ----- | Jan. 29, 1957 |
| 2,792,829 | Calosi | ----- | May 21, 1957 |