DEVICE FOR THE EXCITATION OF NERVE NETWORKS

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1 Claim. (Cl. 128—2.1)

This invention relates to a device for exciting or stimulating neuron networks of test persons through their skin and especially for use in the therapy and diagnostic of nervous disturbances of muscles and blood vessels as well as for the production of phosphene electroseep or electromanconosc.

The devices hitherto for this purpose generally consist of mains-operated electric pulse generators of frequencies from 1 to 100 or 1 to 1000 cycles per second. The outputs of such pulse generators are connected through relatively long cables to two or more metal electrodes which are pressed to the skin surface of the test person at the position most appropriate for excitation. Such devices generally are relatively large, cumbersome and heavy. They also require a long cable connection from the device to the test person. This, especially in electroseep and phosphene devices, impairs the desired effect on the test person because these arrangements impede the free mobility of the test person.

In accordance with the invention the disadvantages of the known devices are avoided by arranging the pulse generator in at least one box type housing which is placed on the body of the test person, and which has attached to its outside at least one of the electrodes. In case this box type housing consists of metal it can serve itself as an electrode. However, the housing is made of insulating material which may be of advantage in view of the circuit elements arranged inside the housing, the electrode can also be attached on the surface of the housing in form of a metal covering or in the form of an appropriate electrode plate. Depending upon the field of application, various forms of electrodes can be used.

Apart from the customary plane electrodes, brush or ring type electrodes for example, fitting into the eye cavities of the test person can be provided. In the latter case it has been found particularly advantageous to provide two ring shaped electrodes connected in parallel and applicable concentrically with respect to each eye cavity of the test person; a third plane or brush shaped electrode is provided, applicable to the occipital region of the cranium or on the neck of the test person. In order to adapt the device to treatment in the dark it is further advantageous to shape the box type housing in such a manner that in operation, the eyes of the test person are closed by the housing tightly, against light. Preferably, the electrode attached to the housing, especially the two electrodes attached on two separate box type housing parts, are pressed to the skin surface by means of an elastic band attached to the housing at the point most favorable for the excitation of the nerve network concerned.

The device according to the invention in which the electric pulse generator forms together with the electrodes a structural unit of compact build, is therefore applicable on the test person in a very simple manner and does not disturb the course of the test.

These and other objects of the invention will be more fully apparent from the drawings annexed herewith in which:

FIG. 1 shows, partially in cross section, and in front elevation, a device according to the invention built into a structural unit;

FIG. 2 shows the principal circuit diagram of a pulse generator as applied to a device according to the invention.

In FIG. 1, which shows a pulse device according to the invention for exciting or stimulating a neuron network, the circuit elements of the pulse generator properly indicated at 1, 1' such as transistors, condensers, resistances, batteries and like, are arranged in two box type housings 2, 2' forming structural units with the two electrodes, 3, 3', respectively consisting for example, of silver or the like and applicable on the skin of a test person 4. Preferably housing parts 2, 2' consist of insulating material. Housing parts 2, 2' with electrodes 3, 3', can be attached by means of belts 5 to the body portion 4, for example, the head of a test person containing the neuron network to be excited or stimulated. The circuit elements of the pulse generator arranged in parts 1, 1' of the device are connected electrically by means of one or more short cables 6. The exciter electrodes 3, 3' connected with the pulse generator, can also be arranged on insulating housings 2, 2' by means of metallicizing the surface of the housings, and electrodes 3, 3' together with housing parts 2, 2' can be pressed firmly by means of belts 5 to the skin surface of the test person.

In order to enhance the transition of current from electrodes 3, 3' to the skin of test person 4, the electrodes can be covered with porous material such as flannel or foam rubber 7, 7', which has been wetted for example by means of a salt solution. A conducting electrode paste may also be applied.

In order to keep the device as little as light as possible subminiature or microtransistor circuits, for example printed circuits, are used for the generator.

The arrangement of the box type housing parts in accordance with the invention and the configuration of the electrodes is always such that the electrodes can be applied in the desired manner at the most favorable point of the test person, for example, on the eyes. Also in accordance with the invention, another electrode, preferably brush-shaped, fitting to the occipital region of the test person, may be provided as schematically indicated at 3' attached to housing 2'.

As circuitry of the pulse generator, any desired known circuits are suitable. Of particular advantage however, a transistor circuit according to FIG. 2 has been found, operating according to the principle of a blocking oscillator. In this circuit, switchable condenser 21 is charged through the collector emitter line of a transistor 20 by means of a battery 22 and adjustable resistance 23 which serves to form the pulse front. Simultaneously, charge condenser 21 is continuously discharged through the resistor condenser combination 24. If the voltage on condenser 21 has reached a certain value, a discharge occurs through the emitter-base line of transistor 20, which involves the formation of the back of the pulse. In the base circuit of transistor 20, a current limiting resistance 25 is provided which in order to avoid a feedback is bridged by a condenser 26. Resistance 27 provided in the output circuit of the transistor serves to control the output voltage. The pulse frequency is adjusted by variable resistance 23 or by the adjustment of condenser 21. In order to measure the effective pulse current an ammeter 28 is arranged in the line to electrodes 3, 3'.

As pulse generators for the device according to the invention, circuits are suitable operating with constant scanning ratio and continually variable frequency, or devices operating with constant pulse duration and variable duration of interval, hence possessing a variable scanning ratio. The latter type of generators can be so dimensioned that the same device permits at short pulse durations for example of less than one msec. optimum conditions for the excitation of a certain neurological
function for example, electrosleep, while at longer pulse durations, optimum conditions can be established for the excitation of another neurological function, for example, phosphene. For this purpose, a generator circuit can be applied as described in Elektronmedizin No. 8 (1963) page 75, Fig. 5. This circuit permits a variable scanning ratio with variable interval duration whereby the pulse length remains constant with varying frequency.

I claim:

Apparatus for the excitation of the nerve networks of the human head, comprising a pair of boxes both together containing complementary electronic pulse generating means, each box having one side wall forming an electrode for contact with one side of the head, and both boxes being electronically interconnected; said pulse generating means including a transistor circuit having a collector emitter connection to its corresponding electrode, adjustable condenser means, a battery for charging said condenser means through said collector emitter connection, thereby forming one side of the pulse of the pulse generating means, and an emitter base connection for discharging said condenser means after the voltage thereon has reached a predetermined value, thereby forming the other side of the pulse of the pulse generating means, said condenser means through said collector emitter connection, thereby forming one side of the pulse of the pulse generating means, and an emitter base connection for discharging said condenser means after the voltage thereon has reached a predetermined value, thereby forming the other side of the pulse of the pulse generating means, and means supported on the head for holding said boxes in contact with opposite sides of the head.

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