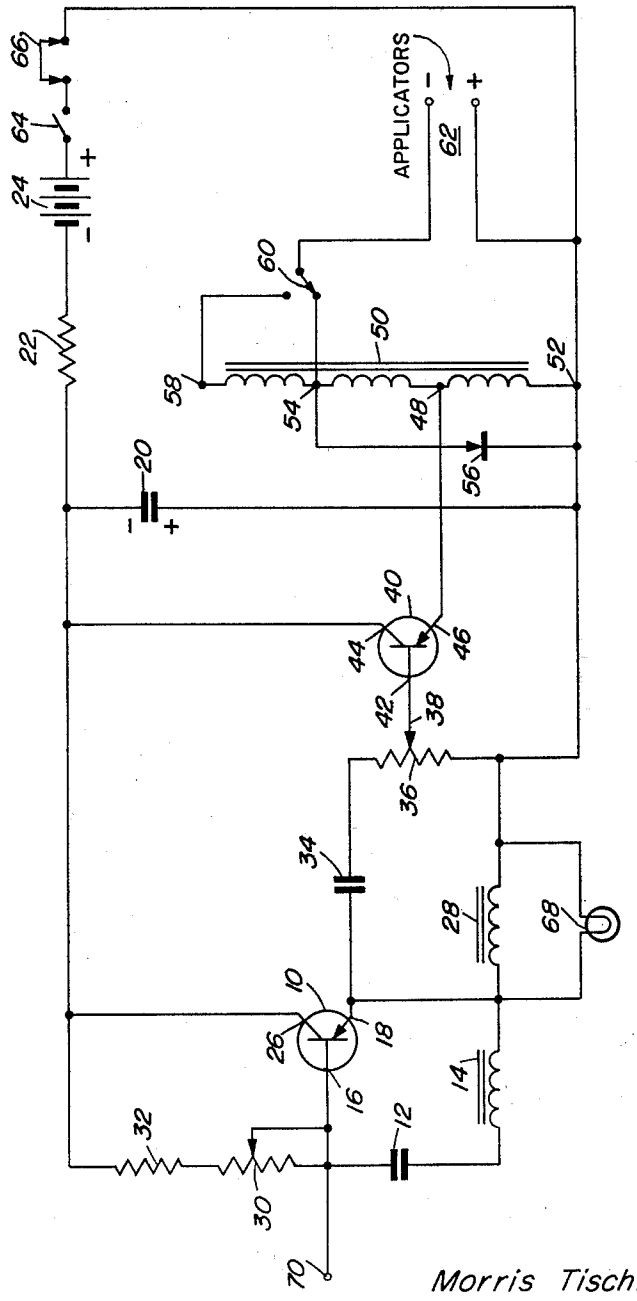
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CARDIAC NERVE CONTROL DEVICE

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# CARDIAC NERVE CONTROL DEVICE

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This invention relates generally to surgical apparatus, and more particularly it pertains to electrical impulse generators for stimulating the cardiac nerves.

It is well known that the muscles of a body can be caused to react to an electrical stimulus. For this purpose, various electrical generators have been devised and used in the art.

An important special adaptation of this principle of electrical stimulus has been the application of regularly spaced electrical pulses to the cardiac nerves for reviving a faltering heart beat. Inasmuch as a great many cases of this sort are of an emergency nature, it is not always possible to have at hand the necessary apparatus for treatment of a patient.

In order to be fully prepared for emergency cardiac nerve treatment of the patient of either the open or closed chest type, a physician needs a versatile, self-powered, compact and light weight instrument which can be included in his emergency kit.

It is an object of the present invention, therefore, to provide a battery-supplied, transistor-operated pulse generating heart stimulator including repetition rate control and amplitude control of a generated unidirectional pulse and having provisions for either open or closed chest electrode use.

Other objects of this invention are to provide a novel transistorized heart stimulator which is compact, which is economical to manufacture, efficient and reliable in operation, and which is easy to maintain.

These and other objects and advantages of this invention will become more readily apparent and understood from the accompanying specification and single FIGURE which illustrates a schematic diagram of a transistorized heart stimulator.

A junction type transistor 10, as depicted schematically in the drawing, is arranged in a blocking oscillator circuit. This circuit includes a capacitor 12 and a reactor 14 connected serially between the base electrode 16 and emitter electrode 18 of the transistor 10.

A supply capacitor 20, charged through a resistor 22 from a battery 24, is provided in the circuit to furnish operating current to the collector electrode 26 and to the emitter electrode 18 through a charging choke coil 28. A variable base biasing resistor 30 and a limiting resistor 32 are provided in the circuit as shown and are serially connected between the base electrode 16 and the collector electrode 26.

A coupling capacitor 34 is also provided in the circuit to effectively connect a resistive potentiometer 36 across the charging choke coil 28. A selected portion of the current developed across potentiometer 36 is fed by means of a variable tap 38 to a base electrode 42 of a second junction transistor 40 arranged in an emitter follower circuit.

Bias current is supplied through the potentiometer 36 to the base electrode 42 from the positive side of the supply capacitor 20. The negative side of the capacitor 20 is connected to the collector electrode 44 of the second junction transistor 40.

The emitter electrode 46 of transistor 40 is connected to a low tap 48 of an autotransformer 50 which has its common connection 52 connected to the positive side of the supply capacitor 20.



Between an intermediate tap 54 and the common tap 52 of the autotransformer 50, there is provided a rectifier diode 56. A two position switch 60 is provided in the circuit to select the voltage provided by the autotransformer 50 either from the intermediate tap 54 or a high voltage tap 58 therefor for a pair of application electrodes 62. Electrodes 62 can be in the form of chest plates, if desired.

A switch 64 as well as a current monitoring jack 66 is provided in the circuit in series with the battery 24. A lamp 68 is connected across the charging choke 28, and it is used to give a visual indication of the generated pulse which may also be monitored at a test point 70.

In actual operation of the transistorized heart stimulator, the electrodes are positioned in the proper position on the chest of the patient. The repetition rate of the blocking oscillator transistor 10 is then adjusted as desired by the base biasing resistor 30. The amplitude of the voltage discharge from the electrodes 62 is adjusted by the potentiometer tap 38. High voltage or low voltage for closed or open chest cardiac stimulation, respectively, is chosen by means of the switch 60. Diode 56 suppresses oscillations and assures unipotential pulse output.

Obviously, many other modifications of the present invention are possible in the light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A cardiac nerve control device, comprising a battery, a transistorized blocking oscillator circuit to translate the power supplied by said battery into electrical impulses and having means to control the frequency of said impulses, means coupled to said blocking oscillator circuit to control the amplitude and shape of said impulses to form an electrical signal having the effect of stimulating normal action of the heart when applied to the nerves and/or muscles thereof, a transistorized emitter-follower circuit coupled to said last mentioned means to receive and amplify said signal, means including a step-up autotransformer coupled to said emitter-follower circuit to receive said signal and vary its voltage to high and low levels for closed and open chest heart stimulation, respectively, and a pair of spaced electrodes to apply the output of said step-up autotransformer to the nerves and/or muscles of the heart.

2. The cardiac nerve control device of claim 1 and in addition a unilaterally conducting element coupled to said step-up autotransformer for suppressing spurious oscillations and assuring a unipotential pulse output of said step-up autotransformer.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 2,004,751 | Fischer | June 11, 1935 |
| 2,295,585 | Lindquist | Sept. 15, 1942 |
| 2,764,683 | Paust et al. | Sept. 25, 1956 |
| 2,830,578 | De Groff | Apr. 15, 1958 |
| 2,848,992 | Pigeon | Aug. 26, 1958 |
| 2,915,066 | Parodi | Dec. 1, 1959 |

OTHER REFERENCES

Thorp: "Electronic Stimulator," October 1943 Electronic Engineering, pp. 188–190.

Denny: "Chronaxie Meter," June 1944 Electronic Engineering, pp. 26–28.

Molyneux article, "Electronic Engineering," March 1957, pages 125–127.

Herrod et al. article, "Surgery," September 1952, pages 510–511. (Copy in Division 55.)