

Claims

1. An implantable pulse generator comprising an electric circuit, the electric circuit comprising:
- 5 — a primary energy store (C₀, C₁, C₂, C₃);
 - at least one secondary energy store (C₄, C₅, C₆); and
 - a control unit, the control unit being configured
 - to activate an electric switch (S₁, Q04) in the electric circuit in such a way that, in a first interval of a first phase of a pulse delivery, the primary energy store (C₀, C₁, C₂, C₃) is discharged via a therapeutic current path, and
 - to activate an electric switch (S₂, S₃, S₄, Q03, Q02, Q01) in the electric circuit in such a way that, in a second interval of the first phase of the pulse delivery, the primary energy store (C₀, C₁, C₂, C₃) and the at least one secondary energy store (C₄, C₅, C₆) are discharged via the therapeutic current path,
- the primary energy store (C₀, C₁, C₂, C₃) and the at least one secondary energy store (C₄, C₅, C₆) being fixedly connected, or connectable, in series,
- characterized in that
- the implantable pulse generator is designed to deliver a shock having an approximately rectangular pulse waveform,
- the implantable pulse generator comprising a plurality of secondary energy stores (C₄, C₅, C₆), and
- the control unit is further configured to activate an electric switch (S₂, S₃, S₄) in the electric circuit in such a way that, in the second interval, the primary energy store (C₀, C₁, C₂, C₃) and, consecutively, all secondary energy stores (C₄, C₅, C₆) are discharged via the therapeutic current path, or
- the primary energy store (C₀, C₁, C₂, C₃) and in each case one of the plurality of secondary energy stores (C₄, C₅, C₆) are discharged via the therapeutic current path.

2. The implantable pulse generator according to claim 1, **characterized in that** the electric circuit comprises a plurality of secondary energy stores (C_4 , C_5 , C_6), the primary energy store (C_0 , C_1 , C_2 , C_3) and the plurality of energy stores (C_4 , C_5 , C_6) being fixedly connected, or connectable, in series, and the control unit being configured to activate one or more electric switches (S_2 , S_3 , S_4) of the electric circuit in such a way that the secondary energy stores (C_4 , C_5 , C_6) are sequentially or consecutively discharged via the therapeutic current path in the second interval of the first phase of the pulse delivery.
3. The implantable pulse generator according to claim 1 or 2, **characterized in that** the control unit is further configured to activate at least one electric switch, preferably a plurality of switches (Q_{05} , Q_{06} , Q_{07} , Q_{08}) of a bridge circuit, in a second phase of the pulse delivery in such a way that the direction of current in the therapeutic current path is reversed.
4. An implantable pulse generator according to any one of the preceding claims, **characterized in that** the primary energy store (C_0) is composed of a plurality of individual energy stores (C_1 , C_2 , C_3) that are fixedly connected in series or connectable in parallel with one another.
5. An implantable pulse generator according to any one of the preceding claims, **characterized in that** the switch or switches (S_1 , S_2 , S_3 , S_4 , Q_{01} , Q_{02} , Q_{03} , Q_{04} , Q_{05} , Q_{06} , Q_{07} , Q_{08}) of the electric circuit is or are electronic switches, in particular selected from: IGBT, AGT, or a combination of the aforementioned electronic switches.
6. An implantable pulse generator according to any one of the preceding claims, **characterized in that** the electric circuit comprises between two and four secondary energy stores, preferably three secondary energy stores (C_4 , C_5 , C_6).

7. An implantable pulse generator according to any one of the preceding claims, **characterized in that** the primary energy store (C_0 , C_1 , C_2 , C_3) and/or the secondary energy store or energy stores (C_4 , C_5 , C_6), independently of one another, are a capacitor or a coil..
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8. The implantable pulse generator according to claim 7, **characterized in that** the plurality of secondary energy stores (C_4 , C_5 , C_6) are formed by a capacitor comprising at least one electrode (K) having a first polarity and at least two second electrodes having a second polarity (A_1 , A_2 , A_3), each electrode (K, A_1 , A_2 , A_3) being
- 10 electrically contactable separately from one another from the outside of the capacitor.
9. An implantable pulse generator according to any one of the preceding claims, **characterized in that**
- the primary energy store (C_0) has a capacitance in the range of 150 μF to 300 μF and/or a nominal voltage in the range of 250 V to 255 V, and/or
 - the secondary energy store or the secondary energy stores (C_4 , C_5 , C_6) has or have a capacitance in the range of 180 μF to 360 μF and/or a nominal voltage in the range of 250 V to 255 V, independently of one another.
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10. A method for delivering an electrical pulse having a substantially rectangular voltage waveform (pulse waveform), comprising the following steps:
- connecting a charged primary energy store (C_0 , C_1 , C_2 , C_3) to a discharge current path in a first interval of a first phase of a pulse delivery; and
 - connecting a plurality of secondary energy stores (C_4 , C_5 , C_6) to the discharge
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- 25 current path in a second interval of the first phase of the pulse delivery, the primary energy store (C_0 , C_1 , C_2 , C_3) and the at least one secondary energy store (C_4 , C_5 , C_6) being fixedly connected, or connectable, in series, and in the second interval, the primary energy store (C_0 , C_1 , C_2 , C_3) and, consecutively, all secondary energy stores (C_4 , C_5 , C_6) being discharged via the therapeutic current
- 30 path, or

the primary energy store (C0, C1, C2, C3) and in each case one of the plurality of secondary energy stores (C4, C5, C6) being discharged via the therapeutic current path.

- 5 11. The method according to claim 10, **characterized in that** a plurality of secondary energy stores (C4, C5, C6) are connected to the discharge current path in the second interval of the first phase of the pulse delivery.
12. The method according to claim 11, **characterized in that**:
- 10 – only one secondary energy store (C4, C5, C6) at a time is connected to the discharge current path, in particular each of the plurality of secondary energy stores (C4, C5, C6) being consecutively connected to the discharge current path, or
- the plurality of secondary energy stores (C4, C5, C6) are sequentially connected to the discharge current path, in particular all secondary energy stores (C4, C5, C6) being consecutively connected to the discharge current path.
- 15 13. A method according to any one of claims 10 to 12, **characterized in that** the connection of the primary energy store (C0, C1, C2, C3) and of the at least one secondary energy store (C4, C5, C6) or of the plurality of secondary energy stores (C4, C5, C6) is carried out in each case by way of a switch (S1, S2, S3, S4, Q01, Q02, Q03, Q04), and in particular by way of an electronic switch.
- 20 14. A method according to any one of claims 10 to 13, **characterized in that** the direction of current in the therapeutic current path is reversed in a second phase of the pulse delivery.
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