of the substrate 302. The inductor 306 may, for example, be a near field coupling coil fabricated, using planar spiral arrangement, in the middle of layers of the PCB of the substrate 302, and surrounding both the IC chip 314 and the peripheral components 316. The top side 302t of the substrate 302 may have encapsulation 312, fabricated from, for example, biocompatible material, for chronic implantation and electrical insulation.

From the above, a coordinated wireless and lead-free muscle stimulation system for dexterous appendage movement control is disclosed. The disclosed muscle stimulation system has two advantages. Firstly, wireless control eliminates percutaneous wires that are required to establish coordination among different stimulation sites to enable dexterous appendage movement. Secondly, each implantable stimulation device has a stimulation IC chip and stimulation electrode(s) integrated on a same PCB board. This allows size scalability and stimulation capability for the dexterous appendage movement control required in different muscles. Integration on the same PCB board avoids the need for lead wires between the stimulation electronics and the electrodes to avoid extra tunneling in the human body, so that lead-free system is achieved.

It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the embodiments~~ without departing from a spirit or scope of the invention as broadly described~~. The embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

CLAIMS

1. A muscle stimulation system for effecting appendage movement, the muscle stimulation system comprising:

first transceiver circuitry;

at least one first implantable stimulation device for implantation adjacent to one or more first muscles responsible for the appendage movement, the first implantable stimulation device configured to be wirelessly activated by the first transceiver circuitry;

second transceiver circuitry;

at least one second implantable stimulation device for implantation adjacent to one or more second muscles responsible for the appendage movement, the second implantable stimulation device configured to be wirelessly activated by the second transceiver circuitry; and

a base station configured to wirelessly communicate with both the first transceiver circuitry and the second transceiver circuitry to receive and transmit signals that causes coordinated activation of the first implantable stimulation device and~~/or~~ the second implantable stimulation device to coordinate stimulation of the first muscles and~~/or~~ the second muscles that are responsible for the appendage movement.

2. A muscle stimulation system according to claim 1, wherein the first transceiver circuitry comprises an inductor for data communication with the first implantable stimulation device and for powering the first implantable stimulation device.

3. A muscle stimulation system according to claim 2, wherein the inductor is a helical coil or a planar coil.

4. A muscle stimulation system according to any one of the preceding claims, wherein the second transceiver circuitry further comprises an inductor for data communication with the second implantable stimulation device and for powering the second implantable stimulation device.

5. A muscle stimulation system according to claim 4, wherein the inductor is a helical coil or a planar coil.

12. A muscle stimulation system according to any one of the preceding claims, wherein the first transceiver circuitry and the second transceiver circuitry are respectively provided as a first wearable external module and a second wearable external module.

13. A muscle stimulation system according to claim 12, wherein the external modules are provided as an integrated unit.

14. A muscle stimulation system according to claim ~~13~~12, wherein the external modules are provided as separate units.

15. A muscle stimulation system according to claim 14, wherein the first wearable external module is provided as a forearm band.

16. A muscle stimulation system according to claim 14 or 15, wherein the second wearable external module is provided as a glove.

17. A muscle stimulation system according to any one of the preceding claims, wherein the first transceiver circuitry and the second transceiver circuitry are each coupled to a respective battery compartment.

18. A muscle stimulation system according to any one of the preceding claims, wherein the first transceiver circuitry and the second transceiver circuitry each comprise an antenna for the wireless communication with the base station.

19. A muscle stimulation system according to any one of the preceding claims, wherein the appendage movement is selected from a group comprising: an orthotic, a prosthesis and atrophied muscles.