

Claims

1. Implantable medical device for stimulating a human or animal heart, comprising a processor, a memory unit, a stimulation unit configured to stimulate the His bundle of a human or animal heart, a first detection unit configured to detect an electrical signal at an atrium of the same heart, and a second detection unit configured to detect an electrical signal at the His bundle of the same heart,
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characterized
in that the memory unit comprises a computer-readable program that causes the processor to perform the following steps when executed on the processor:
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- a) sensing an atrial electric signal (3) with the first detection unit;
 - b) sensing an electric signal (5, 6) at the His bundle with the second detection unit upon termination of a first time period (7) starting upon sensing the atrial electric signal (3) with the first detection unit and/or starting upon applying a stimulation pulse, wherein the first time period (7) lies in a range of from 10 ms to 100 ms;
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c) classifying the electric signal (5, 6) sensed with the second detection unit as His bundle activity signal (5) or as ventricular activity signal (6).
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2. Implantable medical device according to claim 1, **characterized** in that the computer-readable program causes the processor to set a first sensing threshold prior to step b), wherein the first sensing threshold is lower than a His bundle activity signal (5) when detected with the second detection unit, but higher than typically expected noise.
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3. Implantable medical device according to claim 1 or 2, **characterized** in that the computer-readable program causes the processor to set a second sensing threshold (9) prior to step b), wherein the second sensing threshold (9) is higher than a His bundle activity signal (5) when detected with the second detection unit, but lower than a ventricular activity signal (6) when detected with the second detection unit, and to classify the electric signal (5, 6) sensed with the second detection unit as
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ventricular activity signal (6) if the electric signal (5, 6) exceeds the second sensing threshold (9).

4. Implantable medical device according to any of the preceding claims, **characterized**
5 in that the computer-readable program causes the processor to set a marker (16) for the electric signal (5, 6) sensed with the second detection unit, the marker (16) comprising an information on a type of the electric signal (5, 6) reflecting the classifying of the electric signal (5, 6) and a time information reflecting a delayed sensing time, wherein the delayed sensing time is calculated as original sensing time
10 plus a delay time (14), wherein the delay time (14) is shorter than the first time period (7) and lies in a range of from 0 to 50 ms, wherein the electric signal (5, 6) is only classified as His bundle activity signal (5) or as ventricular activity signal (6) if the delayed sensing time does not fall into the first time period (7).
- 15 5. Implantable medical device according to any of claims 1 to 3, **characterized** in that the computer-readable program causes the processor to delay all electric signals (4, 5, 6) sensed by the second detection unit by a delay time (14), wherein the delay time (14) is shorter than the first time period (7) and lies in a range of from 0 to 50 ms.
- 20 6. Implantable medical device according to claim 5, **characterized** in that the computer-readable program causes the processor to set a marker (16) for the electric signal (5, 6) sensed with the second detection unit, the marker (16) comprising an information on a type of the electric signal (5, 6) reflecting the classifying of the electric signal (5, 6) and a time information reflecting a sensing time already
25 comprising the delay time (14), wherein the electric signal (5, 6) is only classified as His bundle activity signal (5) or as ventricular activity signal (6) if the sensing time does not fall into the first time period (7).
7. Implantable medical device according to any of the preceding claims, **characterized**
30 in that the implantable medical device comprises a further stimulation unit configured to stimulate an atrium of the same heart.

8. Method for safely identifying a His bundle activity signal or a ventricular activity signal by a detection unit of an implantable medical device according to any of the preceding claims, the method comprising the following steps:
- 5 a) sensing an atrial electric signal (3) with a first detection unit configured to detect an electrical signal at an atrium of a human or animal heart;
- b) sensing an electric signal (5, 6) at the His bundle with a second detection unit configured to detect an electrical signal at the His bundle of the same heart upon termination of a first time period (7) starting upon sensing the atrial electric signal (3) with the first detection unit and/or starting upon applying a stimulation pulse, wherein the first time period (7) lies in a range of from 10 ms to 100 ms;
- 10 c) classifying the electric signal (5, 6) sensed with the second detection unit as His bundle activity signal (5) or as ventricular activity signal (6).
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9. Computer program product comprising computer-readable code that causes a processor to perform the following steps when executed on the processor:
- a) sensing an atrial electric signal (3) with a first detection unit configured to detect an electric signal at an atrium of a human or animal heart;
- 20 b) sensing an electric signal (5, 6) at the His bundle with a second detection unit configured to detect an electrical signal at the His bundle of the same heart upon termination of a first time period (7) starting upon sensing the atrial electric signal (3) with the first detection unit and/or starting upon applying a stimulation pulse, wherein the first time period (7) lies in a range of from 10 ms to 100 ms;
- 25 c) classifying the electric signal sensed (5, 6) with the second detection unit as His bundle activity signal (5) or as ventricular activity signal (6).
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10. Method of treatment of a human or animal patient in need of such treatment with an implantable medical device for stimulating a human or animal heart, the implantable medical device comprising a processor, a memory unit, a stimulation unit configured

to stimulate the His bundle of a human or animal heart, a first detection unit configured to detect an electrical signal at an atrium of the same heart, and a second detection unit configured to detect an electrical signal at the His bundle of the same heart, the method comprising the following steps:

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- a) sensing an atrial electric signal (3) with the first detection unit;
- b) sensing an electric signal (5, 6) at the His bundle with the second detection unit upon termination of a first time period (7) starting upon sensing the atrial electric signal (3) with the first detection unit and/or starting upon applying a stimulation pulse, wherein the first time period (7) lies in a range of from 10 ms to 100 ms;
- c) classifying the electric signal (5, 6) sensed with the second detection unit as His bundle activity signal (5) or as ventricular activity signal (6);
- d) stimulating the His bundle with the stimulation unit if no ventricular activity signal (6) has been sensed during a second time period starting upon sensing the atrial electric signal (3) with the first detection unit, wherein the second time period lies in a range of from 15 ms to 300 ms.

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