to non-optimal deck structures. Furthermore, the outcome of the construction process is affected, notably due to imprecise pile lane positions and to general construction inefficiencies.

[007] It is an object of the present invention to solve the above-described problems and to provide an improved construction apparatus and method for construction of a dock (quays) with an open structure in civil engineering works.

SUMMARY OF THE INVENTION

[008] The invention covers apparatus that enable the building of docks from the shore in an industrial manner. It also covers building methods using these apparatus. By using the present invention, it may be possible to dispense with marine works. Moreover, different steps in the construction of a quay structure such as fast pile driving and/or drilling, as well as deck erecting can be accomplished using with an all-in-one apparatus. Furthermore, a precise X-Y positioning of piles and deck can also be obtained.

[009] According to a first aspect of the~~The~~ present invention, a dock building apparatus is provided, the~~ provides a~~ dock building apparatus comprising a cantilever arm having a first portion configured to be supported on a ground area and a second portion for overhanging a construction area, the cantilever arm being displaceable perpendicularly to its length; a lifting device mounted on the cantilever arm and movable along the cantilever arm, the lifting device being configured to pick up construction materials including foundation members from the ground area and ~~for~~ bring~~ing~~ said construction materials ~~including foundation members~~ from the ground area to the second portion of the cantilever arm~~–~~; and a foundation building tool movable along the cantilever arm for installing the foundation members in the construction area.

[0010] In an embodiment, the dock building apparatus further comprises a support member mounted on the second portion of the cantilever arm and arranged for bearing on ground in the construction area so as to support the second portion of the cantilever arm. Such support member is preferably located at a distal end of the cantilever arm, and/or retractable, by folding and/or lifting.

[0011] The lifting device may comprise at least one gantry crane slidable along the cantilever arm.

[0012] The foundation building tool comprises a pile driver in a particular embodiment.

[0013] The lifting device may be integrated with the pile driver and movable together with the pile driver along the cantilever arm to pick up piles and position such piles in a driving position of the pile driver. The pile driver may also be configured to

install an inclined foundation by driving a pile at an angle with respect to a vertical direction.

[0014] In accordance with a~~nother~~ second aspect of the present invention, a method of building a dock is described, the method ~~using an apparatus as mentioned above is provided. The method~~ comprisinge~~s~~: arranging a cantilever arm at a first position along a shoreline such that the cantilever arm has a first portion supported on a ground area and a second portion overhanging a construction area; moving a foundation building tool along the cantilever arm to a position in the second portion prescribed for installing at least one foundation member; picking up the foundation member on the ground area with a lifting device mounted on the cantilever arm and movable along the cantilever arm; moving the lifting device along the cantilever arm from the first portion to said prescribed position; installing the foundation member in the construction area using the foundation building tool; displacing the cantilever arm perpendicularly to the cantilever arm to a second position along the shoreline; and with the cantilever arm at the second position, repeating the steps of moving the foundation building tool along the cantilever arm, picking up at least one foundation member, moving the lifting device along the cantilever arm and installing the foundation member.

[0015] In an embodiment of the method, arranging the cantilever arm comprises placing a support member to bear on ground in the construction area so as to support the second portion of the cantilever arm., for example at a distal end of the cantilever arm.

[0016] The method may further comprise: picking up deck parts on the ground area with the lifting device; moving the lifting device along the cantilever arm from the first portion to the second portion of the cantilever arm; and installing the deck parts on the foundation members. The foundation members comprise piles driven into the ground using the foundation building tool, the deck parts typically comprise beams mounted on top of the piles and panels supported by the beams.

[0017] ~~Yet~~ A third~~another~~ aspect of the present invention relates to a dock comprising a deck and a foundation comprising a plurality of piles installed using a method as defined above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Further features and advantages of the invention will become apparent by reading the following detailed description of the embodiments which are given by way of non-limiting examples with reference to the appended drawings, in which:

CLAIMS:

1. A dock building apparatus, comprising:

- a cantilever arm having a first portion configured to be supported on a ground area and a second portion for overhanging a construction area, the cantilever arm being displaceable perpendicularly to the length of the cantilever arm;
- a lifting device mounted on the cantilever arm and movable along the cantilever arm, the lifting device being configured to pick up construction materials including foundation members from the ground area and ~~for~~ bring~~ing~~ said construction materials ~~including foundation members~~ from the ground area to the second portion of the cantilever arm; and
- a foundation building tool movable along the cantilever arm for installing the foundation members in the construction area.

2. The dock building apparatus of claim 1, further comprising a retractable support member mounted on the second portion of the cantilever arm and adapted to be arranged for bearing on ground in the construction area so as to support the second portion of the cantilever arm.

3. The dock building apparatus of claim 2, wherein the support member is located at a distal end of the cantilever arm.

4. The dock building apparatus of claim 2 or 3, wherein the support member is retractable by folding and/or lifting.

5. The dock building apparatus of any one of the preceding claims, wherein the lifting device comprises at least one gantry crane slidable along the cantilever arm.

6. The dock building apparatus of any one of the preceding claims, wherein the foundation building tool comprises a pile driver.

7. The dock building apparatus of claim 6, wherein the lifting device is integrated with the pile driver and movable together with the pile driver along the cantilever arm to pick up piles and position such piles in a driving position of the pile driver.

8. The dock building apparatus of claim 6 or 7, wherein the pile driver is configured to install an inclined foundation by driving a pile at an angle with respect to a vertical direction.

9. A method of building a dock, the method comprising:

- arranging a cantilever arm at a first position along a shoreline such that the cantilever arm has a first portion supported on a ground area and a second portion overhanging a construction area;
- moving a foundation building tool along the cantilever arm to a position in the second portion prescribed for installing at least one foundation member;
- picking up the foundation member on the ground area with a lifting device mounted on the cantilever arm and movable along the cantilever arm;
- moving the lifting device along the cantilever arm from the first portion to said prescribed position;
- installing the foundation member in the construction area using the foundation building tool;
- displacing the cantilever arm perpendicularly to the cantilever arm to a second position along the shoreline; and
- with the cantilever arm at the second position, repeating the steps of moving the foundation building tool along the cantilever arm, picking up at least one foundation member, moving the lifting device along the cantilever arm and installing the foundation member.

10. The method of claim 9, wherein arranging the cantilever arm comprises placing a support member to bear on ground in the construction area so as to support the second portion of the cantilever arm.

11. The method of claim 10, wherein the support member is placed at a distal end of the cantilever arm.

12. The method of any one of claims 9 to 11, further comprising:

- picking up deck parts on the ground area with the lifting device;