

DREDGED SOIL SORTING SYSTEM FOR THE UTILIZATION OF RECLAMATION SOIL

CROSS-REFERENCE TO RELATED APPLICATION

The present application claims priority to and the benefit of Korean Patent Application No. 10-2019-0009178 filed in the Korean intellectual Property Office on January 24, 2019, the entire contents of which are incorporated herein by reference.

BACKGROUND

Technical field

[001] The present disclosure relates to a dredged soil sorting system for the utilization of reclamation soil and a method for the utilization of reclamation soil using the same.

Description of the related Art

[002] Dredging and land reclamation has been being vigorously pushed forward in both home and abroad for effective utilization of national land and securing construction site for harbor/coastal development. Reclamation soils required for dredging and reclamation includes sand and clay dredged from the seabed and crushed stone and earth and sand excavated from the land. The dredged sand and clay occupy the most of such reclamation soils.

[003] The quality standard of sand used as reclamation soil should satisfy that a content of fine soil is within the range of 10-15%. A reclamation method using sand is easy for reclamation works and the ground improvement after reclamation and thus is the most advantageous. However, the supply of sand has become insufficient, long-distance shipping is necessary to move sand, the unit cost of sand has been increased and consequently it is difficult

to supply sand stably.

[004] Recently, marine clay obtainable by dredging the seabed has been used in the reclamation of a lower portion, while minimizing the use of soil or sand obtainable from the ground in the reclamation of an upper portion.

[005] Accordingly, it is effective for reducing construction costs and supplying sand stably to utilize dredged soil which has a fine soil content higher than the aforesaid standard of sand by sorting into sand and fine soil.

[006] In general, wastewater from household and industrial activities has been dramatically increased resulted from urban expansion and industrial development in modern society. Consequently, household sewage and wastewater flow into a river, a reservoir, the sea, etc., precipitating water pollution. At this time, the aforesaid household sewage and wastewater flow thereinto in a state of mixed with household wastes, earth and other foreign substances in a large amount. Thus, as a certain period of time elapsed, such a mixture exists into a sediment type. If existing into the sediment type like the above, as time elapses, water pollution will be getting worse and ill-smelling, and also the smooth flow of the river or the reservoir will be disturbed, allowing intensifying the flood damage. Thus, conventionally a dredger is used to remove such polluted sediments thoroughly.

[007] Related Art 1 (KR Patent Registration No. 1070255) discloses a dredged soil processing system. FIG. 1 shows a configuration view of the dredged soil processing system according to the Related Art 1, which comprises: a plurality of cyclone selectors which isolate dredged soil and water discharged via a power selector, a bucket device and etc., by centrifugal force, followed by outputting only dehydrated sand; a high clean cyclone which dehydrates only sludge having a predetermined size, in the sludge and water transferred from the reservoir vessel,

followed by isolating and outputting the same, and then which discharges the rest of sludge having a size smaller than the predetermined size with water to the next step; a high speed deposition chamber which precipitates the sludge discharged from the high clean cyclone using a predetermined drug; and a filter presser which produces a compressed sludge cake compressed into a cake shape by applying a predetermined pressure to the sludge transferred from the high speed deposition chamber, through a concentration vessel.

[008] That is, the Related Art 1 comprises cyclones, a high clean cycle, a deposition chamber and a filter presser, allowing purifying sewage through selecting and washing dredged soil. However, it does not disclose any aspects for the utilization of dredged soil as reclamation soil for a section required to be reclaimed by sorting the dredged soil into sand and fine soil.

[009] Related Art 2 (KR Patent Registration No. 0849521) discloses a dredging soil sorting separator. FIG. 2 shows a configuration view of the dredging soil sorting separator according to the Related Art 2, which separates dredging soil by size and dewateres small sized sand or sludge, followed by moving the same to the storage yard. According to the Related Art 2, dredging soil obtained from a sewer is put into a screen vibrator, allowing sorting the same respectively into over 0.3mm or below 0.3mm according to mesh size thereof, wherein the dredging soil over 0.3mm is stored for soil covering, and the dredging soil below 0.3mm is dewatered in a screw compressor, followed by being moved to the storage yard. That is, the Related Art 2 discloses a technology which allows recycling the dredging soil over 0.3mm for soil covering.

[010] The Related Art 2 discloses a technology for sorting, dewatering and separating the dredging soil. However, it does not disclose any aspects for the utilization of dredged soil as reclamation soil for a section required to be reclaimed by sorting the dredged soil into sand and

fine soil.

[011] Related Art 3 (KR Patent No. 1075395) discloses an apparatus and a method for recycling dredged soil deposited in a river. FIG. 3 shows a block diagram of the apparatus for recycling the dredged soil deposited in the river according to the Related Art 3. In particular, the Related Art 3 relates to the apparatus and method for recycling polluted dredged soil causing the secondary pollution due to landfill or dumping of wastes, as soil for civil engineering and agriculture, allowing solving environment pollution and reproducing environment friendly land resources.

[012] That is, the Related Art 3 relates to purification of dredged soil, allowing recycling the dredged soil as soil for civil engineering and agriculture. However, it does not disclose any aspects for the utilization of dredged soil as reclamation soil for a section required to be reclaimed by sorting the dredged soil into sand and fine soil.

[013] Related Art 4 (KR Patent No. 0729863) discloses an apparatus for removing sludge from dredged soil and treating polluted water. FIG. 4 shows a configuration view of the apparatus for removing sludge from the dredged soil and treating polluted water according to the Related Art 4, which sucks polluted sediments settling at the bottom of a river or a reservoir using a dredging ship or a device capable of pumping, in a state of draining no water; is capable of carrying out a dredging work with preserving the ecosystem by using method for separating and purifying the pollutant; carries out a work selectively to only an area required to be dredged; separates gravel or sand included in dredged soil and recycles the same; and cleanly purifies polluted water and injects the same into the river or reservoir, allowing preventing the secondary pollution.

[014] That is, the Related Art 4 purifies sand, gravel, polluted water and pollutant from

the dredged soil only for the purpose of recycling the same. However, it does not disclose any aspects for the utilization of dredged soil as reclamation soil for the section required to be reclaimed by sorting the dredged soil into sand and fine soil.

Related Art Document

Patent Document

[015] (Patent Document 1) KR Patent No. 1070255

(Patent Document 2) KR Patent No. 0849521

(Patent Document 2) KR Patent No. 1075395

(Patent Document 2) KR Patent No. 0729863

SUMMARY OF THE INVENTION

[016] Therefore, in order to solve the aforesaid drawbacks of the related arts, the present disclosure is directed to providing an apparatus and a method for treating dredged soil, wherein the dredged soil having a high fine soil (with a grain size of 0.6mm or less) content is sorted into high quality sand (having a fine soil content of 10% or less) and fine soil by using a hydro cyclone, allowing utilization thereof simultaneously in each section required to be reclaimed.

[017] Further, the present disclosure is directed to providing a system for sorting dredged soil which is capable of being utilized effectively as reclamation soil, wherein dredged soil having a fine soil (with a grain size of 0.06mm or less) content of 10% or more is sorted into sand (having a fine soil content of 10% or less) and fine soil for reclamation of the coast or a river; the sorted fine soil is layered on a lower reclamation layer of reclamation ground; and the sorted sand (having a fine soil content of 10% or less) is reclaimed on a sand embankment (or

fill), an upper reclamation layer and a sand replacement layer.

[018] Further, the present disclosure is directed to providing a dredged soil sorting system which is capable of reducing construction costs for dredging and reclamation and increasing stability in supplying sand by sorting the dredged soil into sand (having a fine soil content of 10% or less) and fine soil.

[019] In the meantime, technical problems to be solved in the present disclosure are not limited to the aforementioned problems, and other technical problems, which are not mentioned above, may be clearly understood from the following description by those skilled in the art to which the present disclosure pertains.

[020] According to the first aspect of the present disclosure, the dredged soil sorting system may include: a hydro cyclone having a fine soil outflow portion where dredged soil is inflowed through an inflow portion and the inflowed dredged soil is sorted and separated; and a sand outflow portion; a sand transfer portion which transfers sorted and separated sand to ground required to be reclaimed; and a fine soil transfer portion which transfers sorted and separated fine soil to the ground required to be reclaimed.

[021] According to another aspect of the present disclosure, the dredged soil has a fine soil content of 10% by mass or more.

[022] According to another aspect of the present disclosure, the dredged soil has a fine soil content of 15 to 30% by mass.

[023] According to another aspect of the present disclosure, the dredged soil sorting system may further include a transfer pump which pumps dredged soil from seabed and transfers the same to the inflow portion of the hydro cyclone, and the fine soil has an average grain size of 0.06mm or less.

[024] According to another aspect of the present disclosure, the dredged soil sorting system may further include a screen which is installed between the transfer pump and the hydro cyclone, allowing removing gravel or foreign substances from the dredged soil.

[025] According to another aspect of the present disclosure, the dredged soil sorting system may further include an inflow pump which transfers dredged soil to the inflow portion of the hydro cyclone, and the sand outflowed through the sand outflow portion may have a fine soil content of 10 mass% or less.

[026] According to another aspect of the present disclosure, the dredged soil sorting system may include: a first stage hydro cyclone having an inflow portion which allows inflow of dredged soil, a fine soil outflow portion and which sorts and separates the inflowed dredged soil, allowing outflow of fine soil, a first sand outflow portion which allows outflow of sand containing 10% fine soil by mass or less, and a second sand outflow portion which allows outflow of sand containing more than 10% fine soil by mass; and a second stage hydro cyclone having: a fine soil outflow portion which allows inflow of sand containing more than 10% fine soil by mass and outflowed from the second sand outflow portion of the first stage hydro cyclone and which sorts and separates the inflowed sand, allowing outflow of fine soil, and a sand outflow portion which allows outflow of sand containing 10% fine soil by mass or less, wherein the sand transfer portion transfers sand having a fine soil content of 10% or less outflowed through the first sand outflow portion of the first stage hydro clone and sand having a fine soil content of 10% or less outflowed through the sand outflow portion of the second stage hydro cyclone to ground required to be reclamated, the fine soil transfer portion transfers fine soil outflowed through the fine soil outflow portion of the first stage hydro cyclone, and fine soil outflowed through the fine soil outflow portion of the second stage hydro cyclone to ground

required to be reclaimed.

[027] According to another aspect to the present disclosure, the dredged soil sorting system may further include a coagulation portion which coagulates fine soil separated from the hydro cyclone and transfers the same to the fine soil transfer portion.

[028] According to another aspect to the present disclosure, the dredged soil sorting system may further include: a measurement portion which is disposed to the sand outflow portion of the hydro cyclone and measures a fine soil content in outflowed sand; and a control portion which controls an opening ratio of the sand outflow portion and/or a flow rate and a pressure of dredged soil flowed into the hydro cyclone on the basis of values measured in the measurement portion, allowing controlling a fine soil content of sand outflowed through the sand outflow portion to be 10% or less.

[029] According to another aspect to the present disclosure, the ground required to be reclaimed may include a sand replacement layer, an embankment, a lower reclamation layer and an upper reclamation layer. The fine soil transfer portion transfers the fine soil to the lower reclamation layer of the ground required to be reclaimed, and the sand transfer portion transfers the sand to the sand replacement layer, the embankment and the upper reclamation layer.

[030] According to another aspect to the present disclosure, the sorting system may be installed on an embankment. The sand transfer portion utilizes the sand as a sand replacement layer, an embankment and an upper reclamation layer and the fine soil transfer portion utilizes the fine soil as a lower reclamation layer of the ground required to be reclaimed.

[031] According to another aspect to the present disclosure, the sorting system may be installed on a barge. The sand transfer portion transfers the sand to a sand replacement layer, an embankment and an upper reclamation layer, and the fine soil transfer portion transfers the fine

soil to a barge for transportation or a settler.

[032] According to the second aspect to the present disclosure, a method for the utilization of reclamation soil using a dredged soil sorting system may include steps of: pumping dredged soil having a fine soil content of 10% by mass or more from seabed by a transfer pump; removing gravel and foreign substances from the dredged soil through a screen; outflowing fine soil through a fine soil outflow portion where the dredged soil flows into an inflow portion of a hydro cyclone, followed by sorting and separating the inflowed dredged, and outflowing sand having a fine soil content of 10% or less through a sand outflow portion; coagulating fine soil outflowed through the fine soil outflow portion in a coagulation portion and outflowing coagulated fine soil; transferring sand having a fine soil content of 10% or less to a sand replacement layer, an embankment and an upper reclamation layer through a sand transfer portion and utilizing the same as reclamation soil; and transferring coagulated fine soil to a barge for transportation or a settler through a fine soil transfer portion and utilizing the same as reclamation soil.

[033] According to another aspect to the present disclosure, the step of outflowing fine soil and sand may include steps of: the step of outflowing sand comprises steps of: outflowing fine soil through a fine soil outflow portion where dredged soil flows into an inflow portion of a first stage hydro cyclone, followed by sorting and separating the inflowed dredged soil, outflowing sand containing 10% fine soil by mass or less through a first sand outflow portion and outflowing sand containing more than 10% fine soil by mass through a second sand outflow; and outflowing fine soil through a fine soil outflow portion where sand containing more than 10% fine soil by mass, outflowed through a second sand outflow portion of the first stage hydro cyclone, followed by sorting and separating the inflowed sand, and outflowing sand containing

10% fine soil by mass or less through a sand outflow portion.

[034] According to another aspect to the present disclosure, the method for the utilization of reclamation soil using a dredged soil sorting system of claim 13 may further include steps of: measuring a fine soil content of outflowed sand by a measurement portion disposed to the sand outflow portion of the hydro cyclone; and controlling, through a control portion, a fine soil content of sand outflowed through the sand outflow portion to be 10% or less by regulating an opening ratio of the sand outflow portion and a flow rate and a pressure of the dredged soil flowed into the hydro cyclone on the basis of values measured in the measurement portion.

[035] According to a dredged soil sorting system for the utilization of reclamation soil and a method for the utilization of reclamation soil using the same of an exemplary embodiment of the present disclosure, dredged soil having a high fine soil (with a grain size of 0.6mm or less) content is sorted into high quality sand (having a fine soil content of 10% or less) and fine soil by using a hydro cyclone, which are capable of being utilized simultaneously in each section required to be reclaimed.

[036] According to a dredged soil sorting system for the utilization of reclamation soil and a method for the utilization of reclamation soil using the same of an exemplary embodiment of the present disclosure, dredged soil having a fine soil (with a grain size of 0.06mm or less) content of 10% or more is sorted into sand (having a fine soil content of 10% or less) and fine soil for reclamation of the coast or a river. The sorted fine soil is layered on a lower reclamation layer of reclamation ground and the sorted sand (having a fine soil content of 10% or less) is reclaimed on a sand embankment, an upper reclamation layer and a sand replacement layer.

[037] Further, according to a dredged soil sorting system for the utilization of

reclamation soil and a method for the utilization of reclamation soil using the same of an exemplary embodiment of the present disclosure, construction costs for dredging and reclamation are reduced while increasing stability in supplying sand by sorting the dredged soil into sand (having a fine soil content of 10% or less) and fine soil.

[038] In the meantime, effect to be obtained in the present disclosure are not limited to the aforementioned effects, and other effects, which are not mentioned above, may be clearly understood from the following descriptions by those skilled in the art to which the present disclosure pertains.

BRIEF DESCRIPTION OF THE DRAWINGS

[039] The following drawings attached to the present specification illustrate exemplary embodiments of the present disclosure and serve to further understand the technical spirit of the present disclosure together with the detailed description of the present disclosure, and the present disclosure should not be interpreted as being limited to the items illustrated in the drawings.

FIG. 1 shows a configuration view of a dredged soil processing system according to related art 1.

FIG. 2 shows a configuration view of a dredging soil sorting separator according to Related Art 2.

FIG. 3 shows a block diagram of an apparatus for recycling the dredged soil deposited in the river according to Related Art 3.

FIG. 4 shows a configuration view of an apparatus for removing sludge from the dredged soil and treating polluted water according to Related Art 4.

FIG. 5 shows a configuration view of a dredged soil sorting system for the utilization of

reclamation soil according to the present disclosure.

FIG. 6 shows a configuration view of a dredged soil sorting system for the utilization of reclamation soil using a second stage hydro cyclone, according to the present disclosure.

FIG. 7a shows a top view of a dredged soil sorting system for the utilization of reclamation soil installed on a sand embankment, according to the present disclosure.

FIG. 7b shows a side view of a dredged soil sorting system for the utilization of reclamation soil installed on a sand embankment, according to the present disclosure.

FIG. 8a shows a top view of a dredged soil sorting system for the utilization of reclamation soil installed on a barge, according to the present disclosure.

FIG. 8b shows a side view of a dredged soil sorting system for the utilization of reclamation soil installed on a barge, according to the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[040] The aforementioned objects, other objects, features, and advantages of the present invention will be easily understood with reference to the following exemplary embodiments associated with the accompanying drawings. However, the present invention is not limited to the exemplary embodiments to be described below and may be specified as other aspects. On the contrary, the exemplary embodiments introduced herein are provided to make the disclosed content thorough and complete, and sufficiently transfer the spirit of the present disclosure to the person skilled in the art.

[041] In the present specification, when one constituent element is described as being disposed on another constituent element, one constituent element may be formed directly on another constituent element or a third constituent element may be interposed therebetween

Further, in the drawings, a thickness of each constituent element is exaggerated for effective descriptions of technical contents.

[042] The exemplary embodiments disclosed in the present specification will be described with reference to cross-sectional views and/or top views which are ideal exemplified views of the present disclosure. In the drawings, a thickness of each film and a thickness of each region are exaggerated for effective descriptions of technical contents. Therefore, the forms of the exemplified views may be changed depending on manufacturing technologies and/or permissible errors. Therefore, the exemplary embodiments of the present disclosure are not limited to illustrated specific forms but include the change in forms produced depending on the manufacturing processes. For example, a region, which is illustrated as having a right angle, may be rounded or may have a predetermined curvature. Therefore, the regions illustrated in the drawings have attributes, and the shapes of the regions illustrated in the drawings are intended to exemplify specific forms of the regions of the elements but not to limit the scope of the present disclosure. The terms "first" and "second" are used to describe the various constituent elements in the various exemplary embodiments of the present specification, but the constituent elements should not be limited by the terms. These terms are merely used to distinguish one constituent element from the other constituent elements. The exemplary embodiments described and illustrated herein also include complementary exemplary embodiments thereof.

[043] The terms used in the present specification are for explaining the exemplary embodiments, not for limiting the present disclosure. Unless particularly stated otherwise in the present specification, a singular form also includes a plural form. The term "comprise" and/or "comprising" used in the specification does not exclude existence or addition of one or more other constituent elements in addition to the mentioned constituent element.

[044] In describing the following specific exemplary embodiments, the various particular contents are proposed to more specifically describe the present disclosure and help understand the present disclosure. However, those who are knowledgeable in this field enough to understand the present invention may recognize that the present disclosure may be used without the various particular contents. It is noted that the description of the parts, which are commonly known and are not greatly related to the present disclosure, will be omitted in some instances in order to avoid unnecessary confusion when describing the present disclosure.

[045] Hereinafter, a dredged soil sorting system for the utilization of reclamation soil (100) and a method for the utilization of reclamation soil using the dredged soil sorting system (100) will be described.

[046] According to a dredged soil sorting system for the utilization of reclamation soil (100) and a method for the utilization of reclamation soil using the dredged soil sorting system (100) of an exemplary embodiment of the present disclosure, dredged soil having a high fine soil (with a grain size of 0.06mm or less) content of 10% or more is sorted into sand (having a fine soil content of 10% or less) and fine soil for reclamation of the coast or a river. The sorted fine soil is layered on a lower reclamation layer of reclamation ground and the sorted sand (having a fine soil content of 10% or less) is reclaimed on a sand embankment, an upper reclamation layer and a sand replacement layer.

[047] Further, according to a dredged soil sorting system for the utilization of reclamation soil (100) and a method for the utilization of reclamation soil using the dredged soil sorting system (100) of an exemplary embodiment of the present disclosure, dredged soil having a fine soil (with a grain size of 0.06mm or less) content of 10% or more is sorted into sand (having a fine soil content of 10% or less) and fine soil for reclamation of the coast or a river.

The sorted fine soil is layered on a lower reclamation layer of reclamation ground and the sorted sand (having a fine soil content of 10% or less) is reclaimed on a sand embankment, an upper reclamation layer and a sand replacement layer.

[048] In addition, according to a dredged soil sorting system for the utilization of reclamation soil (100) and a method for the utilization of reclamation soil using the dredged soil sorting system (100), construction costs for dredging and reclamation are reduced while increasing stability in supplying sand by sorting the dredged soil into sand (having a fine soil content of 10% or less) and fine soil.

[049] FIG. 5 shows a configuration view of a dredged soil sorting system for the utilization of reclamation soil according to an exemplary embodiment of the present disclosure. FIG. 6 shows a configuration view of a dredged soil sorting system for the utilization of reclamation soil (100) using a second stage hydro cyclone, according to the present disclosure.

[050] FIG. 7a shows a top view of a dredged soil sorting system for the utilization of reclamation soil (100) installed on a sand embankment, according to the present disclosure. FIG. 7b shows a side view of a dredged soil sorting system for the utilization of reclamation soil (100) installed on a sand embankment, according to the present disclosure. Further, FIG. 8a shows a top view of a dredged soil sorting system for the utilization of reclamation soil (100) installed on a barge, according to the present disclosure. FIG. 8b shows a side view of a dredged soil sorting system for the utilization of reclamation soil (100) installed on a barge, according to the present disclosure.

[051] As shown in FIG. 5, a dredged soil sorting system for the utilization of reclamation soil (100) according to an exemplary embodiment of the present disclosure may be configured to includes a barge (1), a transfer pump (10), a trommel screen (20), a hydro cyclone (30) a

coagulation portion (60), a sand transfer portion (70), a fine soil transfer portion (80), etc.

[052] First, dredged soil is collected through a transfer pump (10, or submersible sand pump) installed on the barge (1, or dredger) and then flows into the hydro cyclone (30) through a transfer pipe (11).

[053] This dredged soil has a fine soil content of 10% by mass or more. More particularly, a fine soil content of the dredged soil is 15 to 30% by mass and an average grain size of the fine soil is 0.06mm or less.

[054] Further, the trommel screen (20) according to an exemplary embodiment of the present disclosure is installed on one side of the transfer pipe (11) between the transfer pump (10) and the hydro cyclone (30), allowing removing gravel, foreign substances, auger, etc., from the dredged soil.

[055] The dredged soil flows into the hydro cyclone (30) via the trommel screen (20).

[056] The hydro cyclone (30) according to an exemplary embodiment of the present may be configured to have a fine soil outflow portion (33) where dredged soil is inflowed through an inflow portion (31) and the inflowed dredged soil is sorted and separated, allowing outflow of fine soil, a sand outflow portion (34), and an inflow pump (32) which transfers the dredged soil to the inflow portion (31) of the hydro cyclone (30).

[057] Sand outflowed through this sand outflow portion (30) has a fine soil content of 10% by mass or less.

[058] Further, it may be configured to measure a content of fine soil contained in sand through a measurement portion disposed to the sand outflow portion (34) of the hydro cyclone (30).

[059] A control portion controls an opening ratio of the sand outflow portion and/or a

flow rate and a pressure of the dredged soil flowed into the hydro cyclone on the basis of values measured in the measurement portion, allowing controlling a fine soil content of the sand outflowed through the sand outflow portion to be 10% or less.

[060] Further, as shown in FIG. 5, the dredged soil sorting system for the utilization of reclamation soil (100) according to an exemplary embodiment of the present disclosure may be configured to include a coagulation portion (60) which coagulates the fine soil separated from the hydro cyclone (30) and transfers the same to the fine soil transfer portion (80). This coagulation portion (60) forms coagulated fine soil by dosing the fine soil with a polymer as a coagulant. An average grain size of the coagulated fine soil is 0.06mm or less.

[061] Further, the sand transfer portion (70) transfers sand having a fine soil content of 10% or less outflowed through the sand outflow portion (34) to ground required to be reclaimed, allowing utilization thereof as reclamation soil. The fine soil transfer portion (80) transfers coagulated fine soil which was coagulated in the coagulation portion (60) following the outflow through the fine soil outflow portion (33), to the ground required to be reclaimed, allowing utilization thereof as reclamation soil.

[062] In particular, as shown in FIG. 5, the ground required to be reclaimed may include a sand replacement layer and an embankment over the sand replacement layer. Further, a settler may include a lower reclamation layer and an upper reclamation layer.

[063] The fine soil transfer portion (80) transfers fine soil to the lower reclamation layer of the ground required to be reclaimed, allowing utilizing the fine soil as reclamation soil. The sand transfer portion (70) transfers sand to the sand replacement layer, the embankment and the upper reclamation layer, allowing utilizing the sand containing 10% of fine soil or less, as reclamation soil for the sand replacement layer, the embankment and the upper reclamation layer.

[064] As shown in FIG. 6, the hydro cyclone (30) of the dredged soil sorting system (100) according to an exemplary embodiment of the present disclosure may be configured to include a first stage hydro cyclone (40) and a second stage hydro cyclone (50).

[065] The first stage hydro cyclone (40) may be configured to include an inflow portion (41) which allows inflow of dredged soil, a fine soil outflow portion (42) which sorts and separates the inflowed dredged soil, followed by outflowing fine soil, a first sand outflow portion (43) which allows outflow of sand containing 10% fine soil by mass or less, and a second sand outflow portion (44) which allows outflow of sand containing more than 10% fine soil by mass.

[066] In addition, the sand containing 10% of fine soil by mass or less outflowed from the first sand outflow portion (43) flows into the sand transfer portion (70). The sand containing more than 10% fine soil by outflowed from the second sand outflow portion (44) flows into an inflow portion (51) of the second stage hydro cyclone.

[067] Further, the second stage hydro cyclone may be configured to include a fine soil outflow portion (53) which allows inflow of sand containing more than 10% fine soil by mass, outflowed from the second sand outflow portion (44) of the first hydro cyclone (40), and sorts and separates the inflowed sand, allowing outflow of fine soil, and a sand outflow portion (54) which allows outflow of sand containing 10% fine soil by mass or less.

[068] Therefore, the sand transfer portion (70) transfers the sand having a fine soil content of 10% or less outflowed through the first sand outflow portion of the first stage hydro cyclone and the sand having a fine soil content of 10% or less outflowed through the sand outflow portion of the second stage hydro cyclone to ground required to be reclaimed

[069] Further, the coagulation portion (60) forms coagulated fine soil by dosing the fine soil separated from the fine soil outflow portion of the first stage hydro cyclone (40) and the fine

soil separated from the fine soil outflow portion (53) of the second stage hydro cyclone (50) with a polymer coagulant.

[070] Further, as shown in FIG. 7a and 7b, the aforementioned dredged soil sorting system (100, dredged soil sorting plant) may be installed on a sand embankment. At this time, sand containing 10% of fine soil or less is transferred to a sand replacement layer, an embankment and an upper reclamation layer through the sand transfer portion (70), allowing utilizing the sand. The fine soil transfer portion (80) transfers coagulated fine soil to a lower reclamation layer of ground required to be reclaimed, allowing utilization thereof.

[071] Further, as shown in FIG. 8a and FIG. 8b, the dredged soil sorting system (100) may be installed on a barge. At this time, the sand transfer portion (70) is coupled with an embankment and transfers sand containing 10% of fine soil or less to a sand replacement layer, an embankment and an upper reclamation layer, allowing utilization thereof. The fine soil transfer portion (80) transfers fine soil to a barge for transportation, allowing transportation to a settler and utilization thereof.

[072] Hereinafter, a method for the utilization of reclamation soil using the aforementioned dredged soil sorting system (100) will be described.

[073] First, dredged soil having a fine soil content of 10% by mass or more is pumped from the seabed by the transfer pump (10). And gravel, foreign substances, auger, etc., are removed from the dredged soil through the trommel screen (20).

[074] The dredged soil flows into the inflow portion (31) of the hydro cyclone (30) through operation of the inflow pump (32), followed by sorting and separating the inflowed dredged soil. Fine soil is outflowed through the fine soil outflow portion (33) and sand having a fine soil content of 10% by mass or less is outflowed through the sand outflow portion (34).

[075] Further, the measurement portion disposed to the sand outflow portion (34) of the hydro cyclone (30) may measure a content of fine soil contained in the outflowed sand. The control portion may control an opening ratio of the sand outflow portion (34) and/or a flow rate and a pressure of the dredged soil flowed into the hydro cyclone (30) on the basis of values measured in the measurement portion, allowing controlling a fine soil content of the sand outflowed through the sand outflow portion to be 10% or less.

[077] As mentioned above, when configured with the first and second stage hydro cyclones (40, 50), the inflow portion (41) of the first stage hydro cyclone (40) allows inflow of the dredged soil, followed by sorting and separating the inflowed dredged soil. The fine soil outflow portion (42) allows outflow of fine soil. The first sand outflow portion (43) allows outflow of sand containing 10% fine soil by mass or less and the second sand outflow portion (44) allows outflow of sand containing more than 10% fine soil by mass.

[078] Further, fine soil outflowed from the fine soil outflow portion (33) is coagulated in the coagulation portion (60), followed by outflowing the coagulated fine soil.

[079] The sand having a fine soil content of 10% or less is transferred to a sand replacement layer, an embankment and an upper reclamation layer through the sand transfer portion (70), followed by utilizing the sand as reclamation soil. Further, the coagulated fine soil is transferred to the barge for transportation (90) or the settler through the fine soil transfer portion (80), followed by utilizing the coagulated fine soil as reclamation soil.

[080] In addition, the system and the method, which have been described above, are not limited by the configurations and methods of the exemplary embodiments as described above, but the exemplary embodiments may also be configured by selectively combining a whole or part of the exemplary embodiments, such that various modifications can be made.

<Reference Numerals>

[081] 1: a barge

10: a transfer pump

11: a transfer pipe

20: a trommel screen

30: a hydro cyclone

31: an inflow portion

32: an inflow pump

33: a fine soil outflow portion

34: a sand outflow portion

40: a first stage hydro cyclone

41: an inflow portion

42: fine soil outflow portion

43: a first sand outflow portion

44: a second sand outflow portion

50: a second stage hydro cyclone

51: an inflow portion

53: a fine soil outflow

54: a sand outflow portion

60: a coagulation portion

70: a sand transfer portion

80: a fine soil transfer portion

90: a barge for transportation

100: a dredged soil sorting system for the utilization of reclamation soil

WHAT IS CLAIMED IS:

1. A dredged soil sorting system (100) for the utilization of reclamation soil, wherein the dredged soil sorting system comprises:
 - a hydro cyclone (30) having:
 - an inflow portion (31) for allowing inflow of dredged soil;
 - a fine soil outflow portion (33) for allowing outflow of fine soil, wherein the dredged soil is inflowed through the inflow portion (31) of the hydro cyclone and the inflowed dredged soil is sorted and separated into sand and fine soil, thereby allowing outflow of the fine soil;
 - a sand outflow portion (34) for allowing outflow of sand;
 - a sand transfer portion (70) for transferring sorted and separated sand to a ground required to be reclaimed; and
 - a fine soil transfer portion (80) for transferring sorted and separated fine soil to the ground required to be reclaimed,
 - wherein
 - the dredged soil has a fine soil content of 10% by mass or more,
 - the fine soil has an average grain size of 0.06mm or less, and
 - the dredged soil sorting system further comprises:
 - a transfer pump (10) for pumping dredged soil from seabed and transferring the dredged soil to the inflow portion of the hydro cyclone;
 - a measurement portion for measuring a fine soil content in outflowed sand, wherein the measurement portion is disposed to the sand outflow portion of the hydro cyclone; and
 - a control portion for controlling at least one of an opening ratio of the sand outflow portion, a flow rate of dredged soil flowed into the hydro cyclone and a pressure of dredged

soil flowed into the hydro cyclone, on the basis of values measured in the measurement portion, thereby allowing controlling a fine soil content of the sand outflowed through the sand outflow portion to be 10% or less.

2. The dredged soil sorting system for the utilization of reclamation soil of claim 1, wherein

the dredged soil has a fine soil content of 15 to 30% by mass.

3. The dredged soil sorting system of claim 1, wherein

the dredged soil sorting system further comprises a screen (20) for installation between the transfer pump and the hydro cyclone, wherein the screen is configured for allowing removing gravel or foreign substances from the dredged soil.

4. The dredged soil sorting system of claim 3, wherein

the dredged soil sorting system further comprises an inflow pump (32) for transferring the dredged soil to the inflow portion of the hydro cyclone.

5. The dredged soil sorting system of claim 3, wherein the dredged soil sorting system comprises:

a first stage hydro cyclone (40) having an inflow portion (41) which allows inflow of dredged soil, a fine soil outflow portion (42) and which sorts and separates the inflowed dredged soil, allowing outflow of fine soil, a first sand outflow portion (43) which allows outflow of sand containing 10% fine soil by mass or less, and a second sand outflow portion (44) which allows outflow of sand containing more than 10% fine soil by mass; and

a second stage hydro cyclone (50) having: a fine soil outflow portion (53) which allows inflow of sand containing more than 10% fine soil by mass and outflowed from the second sand outflow portion (44) of the first stage hydro cyclone (40) and which sorts and separates the inflowed sand, allowing outflow of fine soil, and a sand outflow portion (54) which allows outflow of sand containing 10% fine soil by mass or less, wherein

the sand transfer portion (70) transfers sand having a fine soil content of 10% or less outflowed through the first sand outflow portion (43) of the first stage hydro cyclone (40) and sand having a fine soil content of 10% or less outflowed through the sand outflow portion (54) of the second stage hydro cyclone (50) to ground required to be reclaimed,

the fine soil transfer portion (80) transfers fine soil outflowed through the fine soil outflow portion (42) of the first stage hydro cyclone (40), and fine soil outflowed through the fine soil outflow portion (53) of the second stage hydro cyclone (50) to ground required to be reclaimed.

6. The dredged soil sorting system of claim 1, wherein

the dredged soil sorting system further comprises a coagulation portion (60) for coagulating the sorted and separated fine soil separated from the hydro cyclone and transferring the coagulated fine soil to the fine soil transfer portion.

7. The dredged soil sorting system of claim 1, wherein

the ground required to be reclaimed includes a sand replacement layer, an embankment, a lower reclamation layer and an upper reclamation layer,

the fine soil transfer portion transfers the fine soil to the lower reclamation layer of the ground required to be reclaimed, and the sand transfer portion transfers the sand to the sand replacement layer, the embankment and the upper reclamation layer.

8. The dredged soil sorting system of claim 7, wherein
the sorting system is installed on an embankment,
the sand transfer portion utilizes the sand as a sand replacement layer, an embankment
and an upper reclamation layer, and the fine soil transfer portion utilizes the fine soil as a
lower reclamation layer of the ground required to be reclaimed.

9. The dredged soil sorting system of claim 7, wherein
the sorting system is installed on a barge,
the sand transfer portion transfers the sand to a sand replacement layer, an
embankment and an upper reclamation layer, and the fine soil transfer portion transfers the
fine soil to a barge for transportation or a settler.

10. A method for the utilization of reclamation soil using a dredged soil sorting
system (100) comprising steps of:
pumping dredged soil having a fine soil content of 10% by mass or more from seabed
by a transfer pump;
removing gravel and foreign substances from the dredged soil through a screen;
allowing inflow of the dredged soil through an inflow portion of a hydro cyclone for
sorting and separating the inflowed dredged soil into sand and fine soil;
outflowing the sorted and separated fine soil through a fine soil outflow portion;
outflowing the sorted and separated sand having a fine soil content of 10% or less
through a sand outflow portion;
coagulating the sorted and separated fine soil outflowed through the fine soil outflow
portion in a coagulation portion and outflowing coagulated fine soil;

transferring the sorted and separated sand having a fine soil content of 10% or less to a sand replacement layer, an embankment and an upper reclamation layer through a sand transfer portion and utilizing the sorted and separated sand having a fine soil content of 10% or less as reclamation soil; and

transferring the coagulated fine soil to a barge for transportation or a settler through a fine soil transfer portion and utilizing the coagulated fine soil as reclamation soil.

11. The method of claim 10, wherein

the method comprises steps of:

outflowing the sorted and separated fine soil through a fine soil outflow portion of a first stage hydro cyclone; wherein the hydro cyclone of claim 10 is the first stage hydro cyclone

outflowing the sorted and separated sand containing 10% fine soil by mass or less through a first sand outflow portion of the first stage hydro cyclone;

outflowing the sorted and separated sand containing more than 10% fine soil by mass through a second sand outflow portion of the first stage hydro cyclone; and

inflowing the outflowed sand containing more than 10% fine soil by mass, from the second sand flow output portion of the first stage cyclone, to a second stage hydro cyclone for further sorting and separating of the inflowed sand so as to allow outflowing of fine soil through a fine soil outflow portion of the second stage hydro cyclone and outflowing the sand containing 10% fine soil by mass or less through a sand outflow portion of the second stage hydro cyclone.

12. The method of claim 10 further comprising steps of:

measuring a content of fine soil contained in outflowed sand by a measurement portion disposed to the sand outflow portion of the hydro cyclone; and

controlling, through a control portion, a fine soil content of sand outflowed through the sand outflow portion to be 10% or less by regulating at least one of an opening ratio of the sand outflow portion, a flow rate of the dredged soil flowed into the hydro cyclone, and a pressure of the dredged soil flowed into the hydro cyclone, on the basis of values measured in the measurement portion.

13. The method of claim 11, wherein the method comprises the steps of:

transferring sand having a fine soil content of 10% or less outflowed through the first sand outflow portion of the first stage hydro cyclone and sand having a fine soil content of 10% or less outflowed through the sand outflow portion of the second stage hydro cyclone to the sand replacement layer, the embankment and the upper reclamation layer through the sand transfer portion; and

transferring fine soil outflowed through the fine soil outflow portion of the first stage hydro cyclone, and fine soil outflowed through the fine soil outflow portion of the second stage hydro cyclone to the coagulation portion.