[0012] Other preferred objects of the present invention will become apparent from the following description.

SUMMARY

[0013] In one aspect, there is provided a seafloor haulage system for lifting seafloor materials from the seafloor to the surface, the seafloor haulage system comprising:

at least one line member that extends at least partially between the seafloor and the surface; and

at least one container capable of carrying a load, the container being connected to the line member;

wherein the container has a steerable element that enables the container to manoeuvre as it is propelled through the water.

[0014] Preferably the steerable element comprises at least one adjustable surface. The steerable element may comprise a rudder, flap, and/or at least one adjustable hydrofoil. Preferably the steerable element is controlled to guide the container along a path. The steerable element may be controlled remotely but is preferably controlled autonomously. Preferably the steerable element is controlled by actively trimming the steerable element.

[0015] Preferably the container is a skip. Preferably the container further comprises a position determination system, even more preferably an inertial navigation system that provides a position estimate based on inertial measurements. Alternatively, the position determination system may include magnetic compass, attitude, and/or depth sensors, with potential additional

seafloor processing system separates desirable seafloor materials, such as nodules, from slurry.

[0024] The container may traverse the line member, but preferably the container is affixed to the line member and is propelled by being towed by the line member. Preferably the container is affixed to at least two segments of the line member, a first line member segment for towing the container in a first direction and a second line member segment for towing the container in a second direction.

[0025] Preferably the seafloor haulage system further comprises a surface vessel. Preferably the at least one winch is mounted to the surface vessel. Preferably the line members are supported in the water by the surface vessel. Preferably a plurality of line members, preferably with respective winches, containers and/or buffers, are arranged in parallel from the surface vessel. Preferably the seafloor haulage system further comprises at least one seafloor material collection apparatus. Preferably the at least one seafloor material collection apparatus is connected by a seafloor material transfer pipe to the buffer.

[0026] In another aspect, there is provided a container for hauling seafloor materials from the seafloor to the surface, the container comprising:

a line member attachment assembly;

a cavity for carrying a load of seafloor material; and

at least one steerable element that enables the container to manoeuvre as it is propelled through the water.

[0027] In yet another aspect, there is provided a method of hauling seafloor materials from the seafloor to the surface, the method comprising the steps of:

gathering seafloor material;

transferring gathered seafloor material to at least one container located at or near the seafloor;

guiding the container from at or near the seafloor to at or near the surface using at least one steerable element; and

unloading the container to a surface vessel.

[0028] Preferably the step of gathering seafloor material comprises operating at least one seafloor material collection apparatus to gather seafloor materials. The gathered seafloor materials are preferably transferred from the at least one seafloor material collection apparatus via a pipe, preferably in slurry form.

[0029] Preferably the step of transferring gathered seafloor material to at least one container located at or near the seafloor further comprises the step of transferring the gathered seafloor material to a buffer located at or near the seafloor and then dispensing gathered, seafloor material from the buffer to the at least one container. The method may further comprise the step of processing the incoming seafloor material, preferably by separating desirable seafloor materials, such as seafloor nodules, from incoming slurry, at the buffer.

[0030] Preferably the step of guiding the container from at or near the seafloor to at or near the surface comprises controlling the at least one steerable element. Preferably the container is autonomously controlled. Preferably at least two containers are provided and as one container travels

towards the surface the other container travels towards the seafloor. Preferably the two containers are connected by a single line member. Preferably each container is guided to avoid collision with the other container as they pass each other, preferably by controlling the at least one steerable element. The method preferably comprises simultaneously guiding a first container towards the surface and a second container towards the seafloor.

[0031] The step of unloading the container to a surface vessel preferably comprises releasing the contents of the container into an unloading bin located at or near the surface vessel.

[0032] Preferably the method further comprises the step of towing the container with a line member. Preferably the step of towing the container with a line member comprises actuating a winch that winds the line member onto a spool. Preferably the line member is connected between two winches, preferably via a sheave at a deep sea location, and is simultaneously unwound from a first winch as it is wound onto the second winch to tow the container in a first direction, and is unwound from the second winch and wound onto the first winch to tow the container in a second direction. Preferably a first container travels between the first winch and the sheave located at or near a deep sea location and a second container travels between the second winch and the sheave located at or near a deep sea location.

[0033] Further features and advantages of various embodiment will become apparent from the following detailed description.