Title of the Invention: Deep sea mining system
Abstract Title: Mother ship and robotic deep sea mining system

A mother ship has a submersible work platform which docks with the stern of the mother ship. Whilst docked the platform forms an extension of the mother ship and floats on the surface. The platform may be flooded allowing it to sink to the sea bed. It may be connected with the parent via an umbilical cord. When the platform contacts the sea bed a number of mining robots may be deployed to mine minerals and ores from the sea bed. The robots load the platform and when it is full, they and the platform return to the surface and dock with the mother ship.

1. The Mother Ship and the Submersible Work Platform

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.
1. The Mother Ship and the Submersible Work Platform

- Maximum depth: 6500 meters
- Max. 10km tethering connection
- Seafloor
The Mother Ship and the Work Platform in transit:

1) Hydro Propulsion
2) Bow Thrusters
3) Mining Robots
4) Storage mined minerals
5) 10 km Cable tether SWP
6) Power Pack f. SWP if stand alone
3 The Mothership

1) Hydro Propulsion
2) Thrusters
5) 10 km Cable tether SWP
6) Power Pack f. SWP if stand alone
7) Power Connector to SWP
11) Hydraulic Center Lock Bridge
4 The Submersible Work Platform (SWP)

1) Hydro Propulsion
2) Thrusters
3) Mining ROV
4) Storage mined minerals
5. Deck view of the SWP

3) Mining ROV
4) Storage for mined minerals
8) Hydraulic Ship lock SWP/Mothership
9) Discharge/Maintenance Cranes
10) Connection tether Cable
6. The attachment of the two ships

3) Mining ROV
4) Storage for mined minerals
5) 10 km Cable tether SWP
6) SWP 44 m
7) Power Connector to SWP
8) Hydraulic Ships lock SWP/Mothership
9) Discharge (Maintenance Cranes)
10) Connection tether Cable
11) Hydraulic Center Lock Bridge
The ROV mining vehicle

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TO MINE

ENEGETIC RESOURCES, MARINE MINERALS, BIOLOGICAL RESOURCES

Deep Ocean Submersible Work Platform

A system to mine minerals from up to 6,500 meters under the sea, using a ship that can be divided into 2 parts, the “Mother Ship” and the “Submersible Work Platform” (SWP) the Mother Ship would be the surface based control centre that would direct operations electronically to”Remotely Operated Vehicles” (ROV) on the ocean floor, these ROV (depending on the size of the SWP as to how many ROV would be working from one -SWP) would harvest, dig, or gather minerals, depositing them into a container attached to the ROV and when full, deliver them to the SWP where they would be unloaded and the ROV would then go back to harvesting. The SWP would be powered electrically or hydraulically through an umbilical cable from the Mother Ship, the cable (10 km long) would allow the mother ship to be off station in adverse weather conditions while work continued on the sea floor 24 hours a day 7 days a week.

Both the SWP and the Mother Ship when in transit would be locked together, the propulsion units on the SWP and the Mother Ship would provide power to move the Ship (Mother and SWP) from one location to another.

Both the Mother Ship and the SWP would have twin propellers or twin water jet propulsion systems, as a main power for movement forward and astern, and water jet or propellers’ driving dynamic positioning, this would provide equal amounts of power to both the Mother Ship and the SWP.

While on the surface, the SWP, if needed, would have a containerised power supply that would be stored on the Mother Ship, loaded on board the SWP, when connected would then give the SWP autonomy from the Mother Ship.

To sink the SWP and return it to the surface would be done by a commercially available ballast system, which would be installed in the hull between the hull and the cargo hold.

The SWP has 3 cranes which would load onboard any robots that were unable to return to there house through mechanical failure they would also act as light towers and camera towers to give the operators in the Mother Ship a birds eye view of the whole operation, they would also be used for offloading the cargo into a transit ship to transport the cargo to a refinery onshore.

The movement of the SWP on the seabed would be done by the 2 propellers or water jets in the stern and other movement would be controlled by the dynamic positioning, of which there are on this SWP 4 units (2 left and 2 right) all controlled from the Mother Ship, movement would be required when the 12 ROV working on this SWP had finished work in an area and had been loaded into their houses, an independent remotely operated vehicle mounted on the Mother Ship would have prospected the new location.

The loading and unloading of the ROV and their containers from the SWP would be done with 2 hydraulic arms these arms would also be used to lift the full containers off the ROV and tip the contents into the cargo hold of the SWP and then replace the container back onto the ROV and lock it into position.
Each ROV would have 2 working arms mounted on the front to collect or dig minerals with the ability to load into the container mounted at the back, it would have at its disposal mounted on each side, different tools that could be mounted or changed automatically cameras to control its movements, fish catcher and storage, water sampling, biological storage, lighting, infrared, and other scientific equipment as required would also be fitted to each ROV so as to gain as much information as possible on the seabed environment.

Drawings

1. The Mother Ship and the Submersible Work Platform work mode.
2. Showing the 2 ships joined together
3. The Mother Ship
4. The Submersible Work Platform (SWP)
5. Deck view of the SWP
6. The attachment of the 2 ships
7. The ROV mining vehicle
Drawings Cover Sheet Deep Sea Mining

Drawings

1 The Mother Ship and the Submersible Work Platform work mode.
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CLAIMS

Deep Ocean Submersible Mining Platform

1 A complete mining system to mine the minerals of the deep oceans 24 hours a day 7 days a week regardless of weather conditions. A ship that when reaching its location would divide into 2, the Submersible Work Platform (SWP), and the Mother Ship control centre, when on the surface the 2 units would be locked together as one using power from both units for movement. When disconnected the mother ship would have 100% control over the SWP joined together by an imbecile cord up to 10 km long to allow the Mother Ship freedom of movement in adverse weather, as the SWP was working up to 6.5km below the surface.

Using a system that respects the working environment so as to disturb it as little as possible, using ROV that through remote control, a human operator selects the work to be done. The ROV would pass over its allocated area only two times, once going out and once returning to the SWP. 2 ROV could cover an area 80 meters wide and 600 meters long before returning to the SWP, using a ROV powered by tracks for movement disturbance to the sea floor would be minimal.

2 As in (section 1) A Ship that divides into 2 both the SWP and the Mother Ship would have the same movement capabilities the same thrusters, dynamic positioning capabilities, and movement power so as to simplify maintenance and give the power needed to move on the surface and below the surface and assist in returning to the surface.

3 As in (section 1) The SWP would be working on the ocean floor controlled by the operators on the Mother Ship movement forward and back, left and right, up and down, would be in control of the Ships crew, the ROV movements and work would be the responsibility of the mining operators of which there would be 2 to each ROV working 4 hours with 8 hours rest giving each ROV 6 operators. The power to the ROV would be through the tether to the SWP (hydraulic/electric, fibre optic, mooring cable)

4 The ROV would be lowered using 2 hydraulic arms that would lower and replace the ROV in its house. The same 2 arms would release the cargo basket from the ROV and empty the cargo into the hold and then replace and lock it into position on the ROV.

5 The ROV would carry on its sides tool chests that would have different tools that could be exchanged automatically for different work applications i.e. grabs, buckets, etc.,
Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

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<td>WO2005/030571 A2 (ADVANCED MARINE SUPPORT TECHNOLOGY, INC.) See whole document especially figures 4, 9 and 12.</td>
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<td>US4010560 A (DIGGS) See whole document especially figures 1 and 4.</td>
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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

| B63B |

Worldwide search of patent documents classified in the following areas of the IPC

The following online and other databases have been used in the preparation of this search report.
WPI, EPODOC

**International Classification:**

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