CLAIMS

1. A system for drilling and producing hydrocarbons in potential ice conditions in offshore areas comprising:

a rig having a flotation hull with a relatively flat deck at the upper portion thereof and an ice-bending shape along the lower portion thereof and extending downwardly and inwardly around the periphery of the hull where the ice-bending shape extends from an area of the hull near the level of the deck and extends downwardly near the bottom of the hull; an ice deflecting portion extending around the perimeter of the bottom of the hull to direct ice around the hull and not under the hull; at least three legs that are positioned within the perimeter of the bottom of the flotation hull wherein the legs are arranged to be lifted up off the seafloor so that the rig may be towed through shallow water and also extend to the sea floor and extend further to lift the hull partially or fully out of the water; and a jack-up device associated with each leg to both lift the leg from the sea bottom so that the ice worthy jack-up rig may float by the buoyancy of the hull and push the legs down to the seafloor and push the hull partially up and out of the water when ice floes threaten the rig and fully out of the water when ice is not present; and

a conical piled monopod having a body with a base at the bottom and a top deck at the top wherein the base is attached to pilings that are driven into the seafloor when the conical piled monopod structure is installed for use, an inclined ice engaging surface around the body extending from a wider lower region to a narrower upper region where the lower region is below the sea surface and the upper region is above the sea surface;

wherein the rig is arranged to lift its hull out of the water and drill through the conical piled monopod, lower itself into the water to assume an ice defensive position such that ice would contact the ice-bending shape of the rig when thin ice is present, and be moved away when thick ice is present.

2. The system according to claim 1 or claim 2, further including an anchoring mechanism associated with a foot of each leg to provide additional resistance to the forces an ice floe may impose on the rig.

3. The system according to claim 1, wherein the ice bending surface of the rig is slanted upwardly and outwardly from a smaller dimension neckline to a larger dimension shoulder.

4. The system according to any preceding claim, wherein the ice bending surface of the rig extends vertically at least 8 to 10 or more meters.

5. The system according to claim 4, wherein the angle of the ice-bending surface of the rig is in the range of 30 to 60 degrees from the vertical.

6. The system according to any preceding claim, wherein the body of the conical piled monopod is at least 60 meters across and the monopod structure has a density of less then about 0.20 tonnes/m^3.

7. The system according to any preceding claim, wherein the pilings are greater than or equal to 35 meters below the base.

8. The system according to any preceding claim, wherein the pilings are greater than or equal to 50 meters below the base.

9. A method for drilling a well in ice prone waters, the method comprising:
providing a conical piled monopod having a body with a base at the bottom and a top deck at the top and an inclined ice engaging surface around the body extending from a wider lower region to a narrower upper region where the

lower region is below the sea surface and the upper region is above the sea surface;

driving pilings into the seafloor and attaching the pilings to the conical piled monopod to fix the conical piled monopod to the sea floor,

providing rig having a flotation hull having a relatively flat deck at the upper portion thereof and an ice-bending shape along the lower portion thereof where the ice-bending shape extends from an area of the hull near the level of the deck and extends downwardly near the bottom of the hull and an ice deflecting portion extending around the perimeter of the bottom of the hull to direct ice around the hull and not under the hull;

providing at least three legs that are positioned within the perimeter of the bottom of the hull;

jacking down each leg in a manner that feet on the bottom of the legs engages the sea floor and lifts the hull up and fully out of the water when ice is not threatening the rig while the rig is drilling a well on a drill site;

lowering the hull into the water into an ice defensive configuration so that the ice-bending shape extends above and below the sea surface to bend ice that comes against the rig to cause the ice to submerge under the water and endure bending forces that break the ice where the ice flows past the rig; and

drilling a well over the side of the deck and down through the conical piled monopod.

10. The method according to claim 9 wherein the step of driving the pilings further comprises driving the pilings having at least a 1 meter diameter at least 35 meters into the sea floor.

11. The method according to claim 9 or claim 10 wherein the ice-bending surface extends from a shoulder to a neckline and the step of lowering the hull into the water more particularly comprises lowering the hull into the water so that the

neckline is at least 4 meters below the sea surface and the shoulder is at least 7 meters above the sea surface.

12. The method according to any of claims 9 to 11 further including the step of raising the hull up out of the water when the threat of ice floes are reduced.

13. The method according to any of claims 9 to 12 wherein the step of driving the pilings further comprises driving the pilings having at least a 1.5 meter diameter at least 50 meters into the sea floor.

14. The method according to any of claims 9 to 13 wherein the step of driving the pilings further comprises driving the pilings having at least a 2 meter diameter at least 60 meters into the sea floor.

15. A method for drilling a well in ice prone waters comprising the use of a rig and conical piled monopod as claimed in any of claims 1 to 7.

CLAIMS

1. A system for drilling and producing hydrocarbons in potential ice conditions in offshore areas comprising:

a rig having a flotation hull with a relatively flat deck at the upper portion thereof and an ice-bending shape along the lower portion thereof and extending downwardly and inwardly around the periphery of the hull where the ice-bending shape extends from an area of the hull near the level of the deck and extends downwardly near the bottom of the hull; an ice deflecting portion extending around the perimeter of the bottom of the hull to direct ice around the hull and not under the hull; at least three legs that are positioned within the perimeter of the bottom of the flotation hull wherein the legs are arranged to be lifted up off the seafloor so that the rig may be towed through shallow water and also extend to the sea floor and extend further to lift the hull partially or fully out of the water; and a jack-up device associated with each leg to both lift the leg from the sea bottom so that the ice worthy jack-up rig may float by the buoyancy of the hull and push the legs down to the seafloor and push the hull partially up and out of the water in an ice defensive position when ice floes threaten the rig and fully out of the water when ice is not present; and

a conical piled monopod having a body with a base at the bottom and a top deck at the top wherein the base is attached to pilings that are driven into the seafloor when the conical piled monopod structure is installed for use, an inclined ice engaging surface around the body extending from a wider lower region to a narrower upper region where the lower region is below the sea surface and the upper region is above the sea surface, wherein the body of the conical piled monopod is at least 60 meters across and the monopod structure has a density of less than about 0.20 tonnes/m^3;

wherein the rig is arranged to lift its hull out of the water and drill through the conical piled monopod, lower itself into the water to assume the ice defensive position such that ice would contact the ice-bending shape of the rig when ice is present, and be moved away when desired as the ice thickens.

2. The system according to claim 1, further including an anchoring mechanism associated with a foot of each leg to provide additional resistance to the forces an ice floe may impose on the rig.

3. The system according to claim 1, wherein the ice bending surface of the rig is slanted upwardly and outwardly from a smaller dimension neckline to a larger dimension shoulder.

4. The system according to claim 1, wherein the ice bending surface of the rig extends vertically at least 8 to 10 or more meters.

5. The system according to claim 4, wherein the angle of the ice-bending surface of the rig is in the range of 30 to 60 degrees from the vertical.

6. A system for drilling and producing hydrocarbons in potential ice conditions in offshore areas comprising:

a rig having a flotation hull with a relatively flat deck at the upper portion thereof and an ice-bending shape along the lower portion thereof and extending downwardly and inwardly around the periphery of the hull where the ice-bending shape extends from an area of the hull near the level of the deck and extends downwardly near the bottom of the hull; an ice deflecting portion extending around the perimeter of the bottom of the hull to direct ice around the hull and not under the hull; at least three legs that are positioned within the perimeter of the bottom of the flotation hull wherein the legs are arranged to be lifted up off the seafloor so that the rig may be towed through shallow water and also extend to the sea floor and extend further to lift the hull partially or fully out of the water; and a jack-up device associated with each leg to both lift the leg from the sea bottom so that the ice worthy jack-up rig may float by the buoyancy of the hull and push the legs down to the seafloor and push the hull partially up and out of the water in an ice defensive position when ice floes threaten the rig and fully out of the water when ice is not present; and

a conical piled monopod having a body with a base at the bottom and a top deck at the top wherein the base is attached to pilings that are driven into the seafloor when the conical piled monopod structure is installed for use, an inclined ice engaging surface around the body extending from a wider lower region to a narrower upper region where the lower region is below the sea surface and the upper region is above the sea surface, wherein the pilings are greater than or equal to 35 meters below the base;

wherein the rig is arranged to lift its hull out of the water and drill through the conical piled monopod, lower itself into the water to assume the ice defensive position such that ice would contact the ice-bending shape of the rig when ice is present, and be moved away when desired as the ice thickens.

7. The system according to claim 6, wherein the pilings are greater than or equal to 50 meters below the base.

8. A method for drilling a well in ice prone waters, the method comprising:
providing a conical piled monopod having a body with a base at the bottom and a top deck at the top and an inclined ice engaging surface around the body extending from a wider lower region to a narrower upper region where the lower region is below the sea surface and the upper region is above the sea surface;

driving pilings into the seafloor and attaching the pilings to the conical piled monopod to fix the conical piled monopod to the sea floor, wherein the step of driving the pilings further comprises driving the pilings having at least a 1 meter diameter at least 35 meters into the sea floor;

providing rig having a flotation hull having a relatively flat deck at the upper portion thereof and an ice-bending shape along the lower portion thereof where the ice-bending shape extends from an area of the hull near the level of the deck and extends downwardly near the bottom of the hull and an ice deflecting portion extending around the perimeter of the bottom of the hull to direct ice around the hull and not under the hull;

providing at least three legs that are positioned within the perimeter of the bottom of the hull;

jacking down each leg in a manner that feet on the bottom of the legs engages the sea floor and lifts the hull up and fully out of the water when ice is not threatening the rig while the rig is drilling a well on a drill site;

lowering the hull into the water into an ice defensive configuration so that the ice-bending shape extends above and below the sea surface to bend ice that comes against the rig to cause the ice to submerge under the water and endure bending forces that break the ice where the ice flows past the rig; and

drilling a well over the side of the deck and down through the conical piled monopod.

9. The method according to claim 8 wherein the ice-bending surface extends from a shoulder to a neckline and the step of lowering the hull into the water more particularly comprises lowering the hull into the water so that the neckline is at least 4 meters below the sea surface and the shoulder is at least 7 meters above the sea surface.

10. The method according to claim 8 further including the step of raising the hull up out of the water when the threat of ice floes are reduced.

11. The method according to claim 8 wherein the step of driving the pilings further comprises driving the pilings having at least a 1.5 meter diameter at least 50 meters into the sea floor.

12. The method according to claim 8 wherein the step of driving the pilings further comprises driving the pilings having at least a 2 meter diameter at least 60 meters into the sea floor.