Claims

1. A casing milling system for wellbores, the milling system comprising:

a mill portion comprising at least one cutting element, an axially extending engagement arm, and an orientation and locking mechanism on a distal end of engagement arm; and

a guide system comprising a tubular mill housing having an opening formed in a portion of tubular mill housing with a track formed along a portion of the length of the opening, an elongated, traveling guide arm extending from the tubular mill housing and defined along an axis, a guide assembly disposed to slidingly receive the traveling guide arm, wherein the guide assembly includes a tubular body, a portion of which defines a cylinder section, and a latch assembly.

2. The milling system of claim 1, wherein the orientation and locking mechanism comprises a locking collet and the tubular mill housing includes a shoulder with an opening disposed therein for receipt of the locking collet.

3. The milling system of claim 1, wherein the orientation and locking mechanism comprises a guide mechanism.

4. The milling system 3, wherein the guide mechanism comprises a pin radially extending from the arm.

5. The milling system of claim 1, wherein the track has a first section that is sloped relative to the axis of the elongated traveling guide arm and a second section that is substantially parallel with the axis of the guide arm.

6. The milling system of claim 5, wherein the track comprises a guide way formed in a side wall of the housing.

7. The milling system of claim 6, wherein the guide way is open at an end of the tubular housing.

8. The milling system of claim 1, further comprising a debris barrier positioned in proximity to the tubular mill housing.

9. The milling system of claim 1, wherein the traveling guide arm comprises an internal reservoir and a piston attached to an end of the guide arm and disposed to slide within the cylinder section of the tubular body of the guide assembly, wherein the piston includes a through-bore permitting fluid communication between the reservoir and the cylinder.

10. The milling system of claim 9, further comprising a release valve disposed in the through-bore to control the flow of fluid between the reservoir and the cylinder.

11. The milling system of claim 1 or 8 or 9 or 10, further comprising a sensor disposed to measure movement between a first point in the wellbore and a second point in the wellbore.

12. The milling system of claim 1 or 8 or 9 or 10, further comprising a proximity sensor disposed to measure the relative distance between a fixed portion of the casing milling system and the second point is defined on a portion of the casing milling system movable relative to fixed portion.

13. A casing milling system for wellbores, the milling system comprising:

a mill comprising at least one cutting element, an axially extending engagement arm, and an orientation and locking mechanism on a distal end of engagement arm;

a guide system comprising a tubular mill housing having an opening formed in a portion of tubular mill housing with a track formed along a portion of the length of the opening, an elongated, traveling guide arm extending from the tubular mill housing and defined along an axis, a guide assembly disposed to slidingly receive the traveling guide arm, wherein the guide assembly includes a tubular body, a portion of which defines a cylinder section, and a latch assembly, wherein the traveling guide arm comprises an internal reservoir and a piston attached to an end of the guide arm and disposed to slide within the cylinder section of the tubular body of the guide assembly, wherein the piston includes a through-bore permitting fluid communication between the reservoir and the cylinder and a release valve disposed in the through-bore to control the flow of fluid between the reservoir and the cylinder; and

a sensor disposed to measure movement between a first point in the wellbore and a second point in the wellbore.

14. The milling system of claim 13, wherein the track has a first section that is sloped relative to the axis of the elongated traveling guide arm and a second section that is substantially parallel with the axis of the guide arm.

15. The milling system of claim 14, wherein the track comprises a guide way formed in a side wall of the housing, wherein the guide way is open at an end of the tubular housing.

16. A method for milling a casing in a wellbore, the method comprising:

engaging the track of a guide system of a casing milling system by a mill;

moving the mill along the track from a first position to a second position until the mill is secured to the guide system; and

moving a guide arm of the guide system and to which the mill is attached through a guide assembly of the guide system in order to control movement of the mill and thereby forming a window in the casing.

17. The method of claim 16, further comprising controlling movement of the guide arm by altering the flow of fluid between a first chamber and a second chamber.

18. The method of claim 17, wherein altering the flow of fluid comprises measuring the change in distance between a first fixed point and a second point in the wellbore and between a first chamber and a second chamber and adjusting a valve positioned between the two chambers.

19. The method of claim 17, further comprising selecting a fixed point and a moving point and monitoring the distance between the two points and adjusting a valve to control the flow of fluid between a first and second chamber based on the monitored distance.

20. The method of claim 19, wherein if a monitored distance begins to decrease, opening the valve from a first position to a second position to allow fluid to flow from a reservoir in the cylinder to a reservoir in the elongated arm.

21. The method of claim 20, wherein once the valve has been opened, continuing to monitor the distance and when the monitored distance begins to increase, at least partially closing the valve from the second position to a third position between the first and second positions.

22. The method of claim 21, wherein once the valve has been partially closed, continuing to monitor the distance and when the monitored distance approaches a previous maximum distance, adjusting the valve to close it from the second position to a fourth position.

Claims

1. A casing milling system for wellbores, the milling system comprising:

a mill portion comprising at least one cutting element, an axially extending engagement arm, and an orientation and locking mechanism on a distal end of engagement arm; and

a guide system comprising a tubular mill housing having an opening formed in a portion of tubular mill housing with a track formed along a portion of the length of the opening, an elongated, traveling guide arm extending from the tubular mill housing and defined along an axis, a guide assembly disposed to slidingly receive the traveling guide arm, wherein the guide assembly includes a tubular body, a portion of which defines a cylinder section, and a latch assembly.

2. The milling system of claim 1, wherein the orientation and locking mechanism comprises a locking collet and the tubular mill housing includes a shoulder with an opening disposed therein for receipt of the locking collet.

3. The milling system of claim 1, wherein the orientation and locking mechanism comprises a guide mechanism.

4. The milling system of claim 3, wherein the guide mechanism comprises a pin radially extending from the arm.

5. The milling system of claim 1, wherein the track has a first section that is sloped relative to the axis of the elongated traveling guide arm and a second section that is substantially parallel with the axis of the guide arm.

6. The milling system of claim 5, wherein the track comprises a guide way formed in a side wall of the housing.

7. The milling system of claim 6, wherein the guide way is open at an end of the tubular housing.

8. The milling system of claim 1, further comprising a debris barrier positioned in proximity to the tubular mill housing.

9. The milling system of claim 1, wherein the traveling guide arm comprises an internal reservoir and a piston attached to an end of the guide arm and disposed to slide within the cylinder section of the tubular body of the guide assembly, wherein the piston includes a through-bore permitting fluid communication between the reservoir and the cylinder.

10. The milling system of claim 9, further comprising a release valve disposed in the through-bore to control the flow of fluid between the reservoir and the cylinder.

11. The milling system of claim 1 or 8 or 9 or 10, further comprising a sensor disposed to measure movement between a first point in the wellbore and a second point in the wellbore.

12. The milling system of claim 1 or 8 or 9 or 10, further comprising a proximity sensor disposed to measure the relative distance between a fixed portion of the casing milling system and the second point is defined on a portion of the casing milling system movable relative to fixed portion.

13. A casing milling system for wellbores, the milling system comprising:

a mill comprising at least one cutting element, an axially extending engagement arm, and an orientation and locking mechanism on a distal end of engagement arm;

a guide system comprising a tubular mill housing having an opening formed in a portion of tubular mill housing with a track formed along a portion of the length of the opening, an elongated, traveling guide arm extending from the tubular mill housing and defined along an axis, a guide assembly disposed to slidingly receive the traveling guide arm, wherein the guide assembly includes a tubular body, a portion of which defines a cylinder section, and a latch assembly, wherein the traveling guide arm comprises an internal reservoir and a piston attached to an end of the guide arm and disposed to slide within the cylinder section of the tubular body of the guide assembly, wherein the piston includes a through-bore permitting fluid communication between the reservoir and the cylinder and a release valve disposed in the through-bore to control the flow of fluid between the reservoir and the cylinder; and

a sensor disposed to measure movement between a first point in the wellbore and a second point in the wellbore

wherein the track has a first section that is sloped relative to the axis of the elongated traveling guide arm and a second section that is substantially parallel with the axis of the guide arm.

14. The milling system of claim 13, wherein the track comprises a guide way formed in a side wall of the housing, wherein the guide way is open at an end of the tubular housing.

15. A method for milling a casing in a wellbore, the method comprising:

engaging the track of a guide system of a casing milling system by a mill;

moving the mill along the track from a first position to a second position until the mill is secured to the guide system; and

moving a guide arm of the guide system to which the mill is attached through a guide assembly of the guide system wherein the guide arm slidingly engages the guide assembly in order to control movement of the mill and thereby forming a window in the casing.

16. The method of claim 15, further comprising controlling movement of the guide arm by altering the flow of fluid between a first chamber and a second chamber.

17. The method of claim 16, wherein altering the flow of fluid comprises measuring the change in distance between a first fixed point and a second point in the wellbore and between a first chamber and a second chamber and adjusting a valve positioned between the two chambers.

18. The method of claim 16, further comprising selecting a fixed point and a moving point and monitoring the distance between the two points and adjusting a valve to control the flow of fluid between a first and second chamber based on the monitored distance.

19. The method of claim 18, wherein if a monitored distance begins to decrease, opening the valve from a first position to a second position to allow fluid to flow from a reservoir in the cylinder to a reservoir in the elongated arm.

20. The method of claim 19, wherein once the valve has been opened, continuing to monitor the distance and when the monitored distance begins to increase, at least partially closing the valve from the second position to a third position between the first and second positions.

21. The method of claim 20, wherein once the valve has been partially closed, continuing to monitor the distance and when the monitored distance approaches a previous maximum distance, adjusting the valve to close it from the second position to a fourth position.