upper annular port 502 couples the auxiliary chamber 408 to upper annulus 136. The lower annular port 504 couples the auxiliary chamber 408 to lower annulus 134. The upper tool port 506 and the lower tool port 508 both couple the auxiliary chamber 408 to main tool path 306. The rotatable chamber 408 is rotatable to open and close these ports to selectively establish and switch between conventional circulation flow paths and reverse circulation flow paths through the crossover tool 300.

[0029] In the conventional circulation mode, the rotatable chamber 410 is positioned such that the upper and lower annulus ports 502, 504 are open and in fluid communication through the auxiliary chamber 408. However, upper and lower tools 506, 508 are closed or blocked by the rotatable chamber 410 so fluid traveling through the main tool path 306 does not enter the auxiliary chamber 408. Thus, in the conventional circulation mode, fluid is injected downhole via the main tool path 306 and returns uphole through the lower annulus134, into the auxiliary chamber 408 via the lower annulus port 504, out of the auxiliary chamber 408 and into the upper annulus 136 via the upper annulus port 502. In other words, the auxiliary chamber 408, having both upper and lower annulus ports 502, 504 open, connects the lower annulus 134 to the upper annulus 136, and permits fluid to return uphole therethrough. Thus, conventional circulation is established through the crossover tool 300.

[0030] In one or more embodiments, in the initial position, the lower annular port 504 may be covered by an outer sleeve 510 on the outside of the tool body 302. The outer sleeve 408 may be mechanically coupled to the packer slider 312 such that the outer sleeve 408 is moved downward when the packer dart 402 moves the slider 312, thereby exposing the lower annular port 504, as shown in FIG. 5

[0031] FIG. 6 illustrates the crossover tool 300 in a reverse circulation mode. In order to establish reverse circulation, an activation dart 602 is launched downhole into the main tool path 306. In one or more embodiments, the activation dart 602 includes one or more pins 604, shown more clearly in Figure 7, configured to enter a slot feature 606 formed in an internal wall 608 surrounding the main tool path 306, the wall 608 separating the main tool path 306 from the auxiliary chamber 408. The pin 604 of the activation dart 602 extends through the slot feature 606 and also engages a groove feature 610 of the rotatable chamber 410 located within the auxiliary chamber 408. In one or more embodiments, the groove feature 610 has a helical shape. Thus, the rotatable chamber 410 rotates in response to the pin 604 traversing the helical groove 610 by guided by the straight slot feature 606. Specifically, the rotatable

chamber 410 is rotated into a reverse circulation position. The activation dart 602 stops when it reaches the end of the slot feature 606 and remains within the main tool path 306. The activation dart 602 also includes seals 611 which seal the main tool path 306 while the dart 602 is positioned therein. Thus, during the reverse circulation mode, the main tool path 306 is separated into an upper tool path 306a uphole of the dart 602 and a lower tool path 306b downhole of the dart 602, and the uphole end 308 separated from the downhole end 310. The activation dart 602 acts as a plug or may be replaced by a different plug form.

[0032] The rotatable chamber 410 includes at least two isolated compartments that establish a first auxiliary flow path 612 and a second auxiliary flow path 614 within the auxiliary chamber 408. When the rotatable chamber 410 is in the reverse circulation position, the upper tool port 560 and lower annular port 508 are open and coupled via the first auxiliary flow path 612, thereby placing the upper flow path 306a in fluid communication with the lower annulus 134 and forming a downhole flow path therethrough. Likewise, when the rotatable chamber is 410 is in the reverse circulation position, the upper annular port 502 and the lower tool port 508 are open and coupled via the second auxiliary path 614, thereby placing the lower tool path in fluid communication with the upper annulus 136 and forming an uphole flow path therethrough. Thus, when cement (or other fluid) is injected downhole through a pipe114 (FIG. 1), the cement flows into the upper tool path 306a of the crossover tool 300 and into the first auxiliary flow path 612 and out of the crossover tool 300 into the lower annulus 134 between the liner 132 and the wellbore 108, thereby cementing the liner 132 in a reverse cementing fashion. Accordingly, the return fluid is displaced uphole into the liner 132 and into the lower tool path 306b of the crossover tool 300, into the second auxiliary path 614, and then crossed over to the upper annulus 136. The downhole flow path is thus isolated from the uphole flow path.

[0033] FIG. 7 illustrates switching of the crossover tool 300 from the reverse circulation mode to the conventional circulation mode. The crossover tool 300 can be switched back to the conventional flow mode by rotating the rotatable chamber 410 back into the conventional circulation position and removing the activation dart 602 from the main tool path 306. In one or more embodiments, a deactivation dart 702 is launched into the main tool path 306 of the crossover tool 300 from the surface. Similar to the activation dart 602, the deactivation dart 702 also includes pins 704 configured to enter the slot feature 606 (FIG. 6) formed in the internal wall 608 of the main tool path 306 and also engages the groove feature 610 of the

What is claimed is:

1. A switchable crossover tool, comprising:

a tool body comprising:

a main tool path separable into an uphole tool path and a downhole tool path; and

an auxiliary chamber comprising an uphole annular port and a downhole

annular port; and

a rotatable chamber located and rotatable within the auxiliary chamber and forming a first auxiliary flow path and a second auxiliary flow path through the auxiliary chamber, wherein the rotatable chamber is positionable between: a conventional circulation mode, wherein the uphole tool path and the downhole tool path are in fluid communication, and the uphole annular port and the downhole annular port are in fluid communication through the auxiliary chamber; and

a reverse circulation mode, wherein the uphole tool path is in fluid communication with the downhole annular port via the first auxiliary flow path, and the downhole tool path is in fluid communication with the uphole annular port via the second auxiliary flow path.

2. The tool of claim 1, wherein rotation of the rotatable chamber is driven by a dart.

3. The tool of claim 2, wherein the uphole tool path is separated from the downhole tool path by the dart.

4. The tool of claim 1, further comprising an actuatable packer located on the tool body and configured to separate the uphole annular port from the downhole annular port.

5. The tool of claim 4, wherein the actuatable packer is actuated by a packer dart.

6. The tool of claim 5, further comprising an uphole end and a downhole end, wherein the uphole end is configured to couple to a conveyance and the downhole end is configured to couple to a casing segment or casing hanger.

7. A switchable crossover system for reverse cementing, comprising:

a switchable crossover tool coupled between a conveyance and a casing segment located within a well, the switchable crossover tool comprising:

a tool body comprising:

a main tool path; and

an auxiliary chamber comprising a first auxiliary path and a second auxiliary path; and

a rotator coupled to and rotatable with respect to the tool body to direct flow through the switchable crossover tool, wherein the rotator is rotatable between a conventional circulation mode and a reverse circulation mode;

wherein in the conventional circulation mode, the conveyance is in fluid communication with the casing segment via the switchable crossover tool; and

wherein in the reverse circulation mode, the conveyance is in fluid communication with a downhole annulus between the casing segment and the well via the first auxiliary path and the casing segment is in fluid communication with the uphole annulus via the second auxiliary path.

8. The system of claim 7, wherein the switchable crossover tool further comprises an annular packer located between the tool body and the well, separating an uphole annulus uphole of the annular packer from the downhole annulus downhole of the annular packer.

9. The system of claim 8, wherein in the conventional circulation mode, the conveyance is in fluid communication with the casing segment via the main tool path and the downhole annulus is in fluid communication with the uphole annulus via the auxiliary chamber.

10. The system of claim 7, wherein rotation of the rotator is driven by a dart.

11. The system of claim 10, wherein the rotator is rotatable from the conventional circulation mode into the reverse circulation mode by an activation dart and the rotator is rotatable from the reverse circulation mode to the conventional circulation mode by a deactivation dart, wherein the deactivation dart is configured to traverse the entire main tool path, thereby ejecting the activation dart from the main tool path.

12. A method of reverse cementing a well having a borehole wall, comprising:

setting a packer in an annulus between a crossover tool and the borehole wall,

wherein the packer separates the annulus into an uphole annulus and a downhole annulus;

separating a main tool path of the crossover tool into an uphole tool path and a downhole tool path;

launching an activation dart into the main tool path to rotate the rotator into the reverse circulation mode; and

rotating a rotator of the crossover tool into a reverse circulation mode, putting the uphole tool path is put in fluid communication with the downhole annulus through a first auxiliary path of the crossover tool and the downhole tool path is put in fluid communication with the uphole annulus through a second auxiliary path of the crossover tool.

13. The method of claim 12, wherein the activation dart separates the main tool path into the uphole tool path and the downhole tool path.

14. The method of claim 12, further comprising:

rejoining the uphole tool path and the downhole tool path; and

rotating the rotator into a conventional circulation mode, wherein the downhole annulus is placed in fluid communication with the uphole annulus via an auxiliary chamber of the crossover tool.

15. The method of claim 14, wherein the first and second auxiliary paths are located within the auxiliary chamber.

16. The method of claim 12, wherein placing the crossover tool in reverse circulation mode further comprises:

forming a downhole flow path through the uphole tool path and the downhole annulus; and forming an uphole flow path through the downhole tool path and the uphole annulus.

17. The method of claim 14 further comprising rotating the rotator into conventional circulation mode which comprises:

forming a downhole flow path through the main tool path; and

forming an uphole flow path through the downhole annulus, the auxiliary chamber, and the uphole annulus.