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<td>BAKER HUGHES INCORPORATED [US/US]; 3900 Essex Lane, Houston, TX 77027 (US).</td>
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<td><strong>Agents</strong></td>
<td>ROWOLD, Carl, A. et al.; 3900 Essex Lane, Houston, TX 77027 (US).</td>
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**Title:** RETRIEVABLE WHIPSTOCK SYSTEM

**Abstract**

A retrievable whipstock system is provided for use on a single trip into a wellbore to cut a window (8) through a casing wall (4) for passage of a drilling string used to drill a sidetrack borehole. The retrievable sidetrack system includes a mill (14) for both starting and cutting the window through the casing, and a whipstock (20) having a deflector surface for directing the mill into the casing to cut the window. A cylindrical head (18) is included within which is releasably secured a stabilizer sleeve (16) for reducing vibration of the mill during cutting of the window to extend the service life of the mill. A whipstock anchor (24) releasably secures the whipstock within the casing, and is settable, selectively releasably, and further releasably resettable so that the whipstock may be repositioned and reoriented within the wellbore numerous times.
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RETRIEVABLE WHIPSTOCK SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention:

This invention relates generally to a method and apparatus for cutting a window through a casing string for passage of a drillstring used to drill a sidetrack borehole from a cased wellbore.

2. Description of the Prior Art:

Prior-art whipstock systems have been utilized to cut windows through casing for passage of wellbore tools used to drill sidetrack boreholes. One such example is the whipstock apparatus disclosed in U.S. Patent Number 4,397,355, entitled "Whipstock Setting Method and Apparatus," invented by McLamore, and issued to Masco Corporation, of Houston, Texas. However, in prior-art whipstock systems, several trips into a wellbore are required to set the whipstock apparatus and to mill a window through the casing string large enough for passage of a drillstring.

In operations using prior-art whipstock systems, a first trip usually is made to set the whipstock and start milling a window. Then, a second trip into the wellbore is made to mill the window through the casing. Typically, a third trip then is made to ream the casing window upwardly to enlarge the window longitudinally to provide sufficient clearance for a drillstring to pass from the original wellbore, through the casing window, and into the sidetrack borehole. This longitudinal clearance is required so that the drillstring will have sufficient space to bend around the angle between the initial wellbore and the sidetracked borehole. Lastly, an fourth trip may be made if it is desired to retrieve the whipstock apparatus.
A need exists for a whipstock system for use in forming sidetracked boreholes from cased wellbores that requires only a single trip into the wellbore to accomplish setting the whipstock, milling a window, and enlarging or reaming the window to a size sufficient to permit passage of a drillstring.
SUMMARY OF THE INVENTION

It is one objective of the present invention to provide a whipstock system for milling a window through a casing wall for passage of a drillstring to drill a sidetrack borehole in a single trip into a wellbore.

It is another objective of the present invention to provide a retrievable whipstock system for milling a window through a casing wall for passage of a drillstring to drill a sidetrack borehole in a single trip into a wellbore.

It is yet another objective of the present invention to provide a retrievable whipstock system having a whipstock anchor which is settable, releasable, and resettable on a single trip into a wellbore.

It is yet another objective of the present invention to provide a whipstock system having a stabilizer sleeve to prevent vibration of a milling tool used for cutting a window through a wellbore casing, the stabilizer sleeve for dampening vibration of the milling tool and extending the service life of the milling tool.

It is still another objective of the present invention to provide a retrievable whipstock system having a keyed cylindrical head within which multiple wellbore tools may be run for an aligned engagement within the cylindrical head.

It is a further objective of the present invention to provide a retrievable whipstock system having an anchor packer including a controlled release latch which is settable, then releasable by application of a predetermined force, and then further releasably resettable.
These objectives are achieved as is now described. A retrievable whipstock system is provided for use in a wellbore to cut a window through a casing wall on a single trip into a wellbore, the window being cut for passage of a drillstring for drilling a sidetrack borehole. The retrievable whipstock system includes a mill secured to a workstring for cutting the window into and through the casing wall. The whipstock is securable within the casing by an anchor packer which is selectively releasable by application of a predetermined force amount, and then is further releasably resettable. The whipstock includes a deflector surface for directing the mill into the casing for cutting the window, and later for directing a drillstring through the window to drill a sidetrack borehole. The whipstock also includes a cylindrical head which is disposed around a stabilizer sleeve which is releasably secured to the mill. The stabilizer sleeve extends the service life of the mill by preventing vibration of the mill as the mill is rotated to cut the window into the casing.

In the preferred embodiment of the present invention, the releasable whipstock system, as initially run into the wellbore, includes a hydraulically expandable mill which is releasably secured within a stabilizer sleeve, which is in turn releasably secured within a cylindrical head. The cylindrical head is affixed to the upper end of a whipstock having a deflector surface for deflecting the hydraulically expandable mill into the casing to mill the window, and later for directing a drillstring through the window to drill a sidetrack borehole. A safety joint is affixed to the lower end of the whipstock, and is separable by application of a predetermined force. The safety joint secures the whipstock to an anchor packer. The anchor packer includes a controlled release latch which is settable, selectively releasable by application of a predetermined force amount, and then releasably resettable for resecurement of the anchor packer within the wellbore. After setting the whipstock and milling the window through the casing wall in a single trip into the wellbore, the mill and stabilizer sleeve then can be removed from the
wellbore and a drillstring may be passed through the cylindrical head and the window, and into a sidetrack borehole for drilling of the sidetrack borehole. The whipstock and anchor packer then can be removed after drilling the sidetrack borehole.

Additional objects, features and advantages will be apparent in the written description which follows.
BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 is a partial, longitudinal section view depicting a retrievable whipstock system of the present invention disposed within a wellbore.

Figure 2 is a one-quarter, longitudinal section view depicting a hydraulically expandable mill of the preferred embodiment of the present invention.

Figure 3 is a cross-section, plan view of the hydraulically expandable mill showing the stabilizer sleeve and cylindrical head of the preferred embodiment of the present invention.

Figure 4 is a one-quarter, longitudinal section view depicting a combination mill assembly of an alternative embodiment of the present invention.

Figure 5 is a section view, taken along line A--A of Figure 4, showing a stabilizer sleeve of the combination mill of an alternative embodiment of the present invention.
Figure 6 is a section view, taken along line B--B of Figure 4, showing a string mill used in the combination mill assembly of an alternative embodiment of the present invention.

Figure 7 is a section view, taken along line C--C of Figure 4, showing a combination mill used in the combination mill assembly of an alternative embodiment of the present invention.

Figures 8a, 8b, 8c, and 8d are one-quarter, longitudinal section views which, when read together, depict an anchor packer of the preferred embodiment of the present invention in a released position within the wellbore.

Figures 9a, 9b, 9c, and 9d are one-quarter longitudinal section views which, when read together, depict the anchor packer of the preferred embodiment of the present invention in a first setting position within the wellbore, with a rotation release J-latch released to allow a slip assembly to move relative to a slip seat.

Figure 10 is a detailed view of the rotation release J-latch as depicted in Figure 8d, showing an enlarged view of a rotation release latch collet finger selectively coupled to the coupling end of a rotation release J-latch lock ring.

Figures 11, 12 and 13 are cross-section, plan views of the anchor packer of the preferred embodiment of the present invention taken about the rotation release J-latch shown in Figures 8d and 9d, and, when read together, depict operation of the rotation release J-latch to selectively uncouple the slip elements of the slip-gripping mechanism for movement
relative to and engagement with the slip seat of the slip-gripping mechanism.

Figure 14 is a perspective view depicting a J-latch assembly of an alternative embodiment of the present invention showing the J-latch assembly in an uncoupled position.

Figure 15 is a partial, one-quarter, longitudinal section view depicting the anchor packer of the preferred embodiment of the present invention in a second setting position within the wellbore, showing a ratchet latch being urged into a first latching position as the slip elements of the slip-gripping mechanism are urged to move relative to the slip seat of the slip-gripping mechanism and into gripping engagement with the casing.

Figure 16 is a partial, one-quarter, longitudinal section view depicting the anchor packer of the preferred embodiment of the present invention in a third setting position, showing the ratchet latch in a second latching position for retaining sealing energization of a set of packing sleeves.

Figure 17 is a partial section view depicting operation of the controlled release latch of the preferred embodiment of the present invention, depicting the lock ring in an unlatched position.

Figure 18 is a partial section view depicting operation of the controlled release latch of the preferred embodiment of the present invention, depicting the lock ring in a latched position.
Figure 19 is a partial section view depicting operation of the controlled release latch of the preferred embodiment of the present invention, depicting the lock ring in a release position.

Figure 20 is a partial section view of the controlled release latch of the preferred embodiment of the present invention, depicting the lock ring in a reset position.

Figure 21 is a longitudinal section view depicting operation of the preferred embodiment of the present invention, showing the mill after disengagement from the whipstock assembly and starting to cut a window through the casing wall.

Figure 22 is a longitudinal section view depicting operation of the preferred embodiment of the present invention, showing the mill cutting the window through the casing wall.

Figure 23 is a longitudinal section view depicting operation of the preferred embodiment of the preferred invention, showing the mill reaming the upper portion of the window so that the window is enlarged longitudinally along the wellbore so that later run drillstrings, and casing strings, will be able to pass from the wellbore, through the casing window, and into the sidetracked borehole.

Figure 24 is a longitudinal section view depicting operation of the preferred embodiment of the present invention, showing the mill after it has been pulled up into the stabilizer sleeve and cylindrical head of the whipstock assembly, prior to shearing the stabilizer sleeve out of the cylindrical sleeve.
Figure 25 is a detailed view of the mill assembly depicted in Figure 21.

Figure 26 is a detailed view of the mill assembly depicted in Figure 22.

Figure 27 is a detailed view of the mill assembly depicted in Figure 23.

Figure 28 is a detailed view of the mill assembly depicted in Figure 24.
DETAILED DESCRIPTION OF THE INVENTION

Referring now to the Figures, and particularly to Figure 1, a partial longitudinal section view of retrievable whipstock system 2 disposed within casing string 4 in wellbore 6 is shown. Retrievable whipstock system 2 is used for cutting window 8 in the wall of casing string 4 through which a sidetracked borehole 10 can be drilled. Retrievable whipstock system 2 is secured to the lower end of workstring 12 for lowering into wellbore 6.

Retrievable whipstock system 2 includes mill 14 releasably secured inside of stabilizer sleeve 16, which is releasably secured inside of cylindrical head 18. Cylindrical head 18 is affixed to the top of whipstock 20. Safety joint 22 is conventional and releasably secures whipstock 20 to anchor packer 24. Safety joint 22 will separate to release whipstock 20 from anchor packer 24 if anchor packer 24 cannot be released for removal from wellbore 6.

With reference to Figure 2, a partial section view depicts hydraulically expandable mill 14 secured within the stabilizer sleeve 16 and cylindrical head 18 is depicted. Hydraulically expandable mill 14 has hydraulically expandable arms 26 which may be expanded radially outward about mill nose 28. Hydraulic mill piston 30 is urged into engagement with arms 26 by pressurized fluids to expand hydraulically expandable arms 26. Flow ports 32 restrict flow of circulation fluids to insure that adequate pressure will be provided for actuating hydraulic mill piston 30 for expansion of hydraulically expandable arms 26. Cutting surfaces are provided on hydraulically expandable arms 26 and mill nose 28 by METAL MUNCHER® (a trademark of Baker Hughes Incorporated) buttons 34.
METAL MUNCHER® buttons 34, which are used to provide cutting surfaces in the preferred embodiment of the present invention, are disclosed in U.S. Patent Number 4,887,668, invented by Lynde et al., and issued to Tri-State Oil Tools Industries, Inc., on December 19, 1989; U.S. Patent No. 4,978,260, invented by Lynde et al., and issued to Tri-State Oil Tools, Inc., on December 18, 1990; and U.S. Patent No. 4,984,488, invented by Lynde et al., and issued to Tri-State Oil Tools, Inc., on January 15, 1991. Although METAL MUNCHER® buttons 34 are used in the preferred embodiment of the present invention, mills in other embodiments of the present invention may utilize cutting surfaces including crushed carbide, diamonds, or other materials.

With reference to Figure 3, a cross-sectional, plan view is shown of hydraulically expandable mill 14 secured within stabilizer sleeve 16 and cylinder head 18. In a preferred embodiment of the present invention, stabilizer sleeve 16 is shaped so that water courses 42 will be divided between stabilizer sleeve 16 and cylindrical head 18 for return of circulation fluids upheole. Mill shear screws 44 are provided to releasably secure mill 14 within stabilizer sleeve 16. Stabilizer sleeve shear screws 46 are provided to releasably secure stabilizer sleeve 16 within cylindrical head 18. Further, torque pins 48, which in the preferred embodiment are lugs, are affixed to cylindrical head 18 for mating with slots 50 in stabilizer sleeve 16. Additionally, a clearance 52 is provided between mill 14 and stabilizer sleeve 16 to permit rotation of mill 14 and to prevent undesirable lateral movement of mill 14 as the mill is rotated to cut window 8 into casing string 4.

Mill shear screws 44 are sized so that they will shear under application of less force than stabilizer sleeve shear screws 46, wherein mill 14 may be released from securement with stabilizer sleeve 16 to cut window 8 in casing 4 and start drilling of sidetrack borehole 10 while stabilizer sleeve 16 remains
secured within cylindrical head 18. Stabilizer sleeve shear screws 46 can be sheared for removal of mill 14 and stabilizer sleeve 16 from within cylindrical head 18, so that workstring 12, mill 14, and stabilizer sleeve 16 can be tripped, or removed, from wellbore 6 while whipstock 20 and anchor packer 24 remain secured within wellbore 6.

Torque pins 48 provide engagement between cylindrical head 18 and stabilizer sleeve 16 for transfer of torque prior to shearing of stabilizer sleeve shear screws 46, and for later engagement with slotted members, such as stabilizer sleeve 16, which may be run into the wellbore later for securement within cylindrical head 18 for torque transference therebetween, after removal of initial mill 14.

Referring again to Figure 1, in the preferred embodiment of the present invention, retrievable whipstock system 2 can be set within casing string 4 of wellbore 6, then mill shear screws 44, shown in Figure 3, can be sheared to release mill 14 so that it can be rotated to cut window 8. After cutting a window 8 through casing 4, mill 14 can be pulled back into stabilizer sleeve 16 and cylindrical head 18, then workstring 12 can be pulled further uphole to shear stabilizer sleeve shear screws 46 and remove both mill 14 and stabilizer sleeve 16 from within cylindrical head 18 and wellbore 6 while whipstock 20 and anchor packer 24 remain secured within casing string 4 in wellbore 6. Then, a drillstring (not shown) can be run into wellbore 6, through cylindrical head 18, and deflected by whipstock 20 to drill sidetrack borehole 10. After drilling of sidetrack borehole 10, workstring 12 may be run again with a fishing spear not shown in Figure 1 for engagement with the full bore of cylindrical head 18 for release of anchor packer 24 from gripping and sealing engagement with casing string 4 within wellbore 6, and for removing anchor packer 24 of whipstock 20.
Referring again to Figure 3, clearance 52 prevents lateral movement about a longitudinal axis of mill 14 as mill 14 is rotated for cutting window 8. Stabilizer sleeve 16 is retained within cylindrical head 18 which is anchored in wellbore 6 by anchor packer 24. Stabilizing mill 14, to prevent and dampen lateral movement about a longitudinal axis while cutting window 8, extends the service life of mill 14 and METAL MUNCHER® buttons 34.

Stabilizer sleeve 16 is configured with a central bore for passage of mill 14 which is eccentric within cylindrical head 18 to center mill 14 above the deflector surface of whipstock 20.

Referring to Figure 4, a one-quarter, longitudinal, section view is shown of combination mill assembly 62 of an alternative embodiment of the present invention. Combination mill assembly 62 includes combination mill 64, and string mill 66, which is used for reaming or enlarging window 8, shown in Figure 1. Combination mill 64 and string mill 66, in the alternative embodiment of the present invention shown, have cutting surfaces formed of METAL MUNCHER® buttons 34.

With reference to Figure 5, a section view taken along line A--A of Figure 4 depicts stabilizer sleeve 68 of combination mill assembly 62 of an alternative embodiment of the present invention. Stabilizer sleeve 68 of the alternative embodiment shown is secured within cylindrical head 18 by mill shear screw 70 and stabilizer shear screw 72. Further, torque pins 48 provide a torque transfer engagement and also provide keyed surfaces for engagement within slots in alternative stabilizer sleeve 68 for alignment of sleeve 68 with cylindrical head 18. Further, stabilizer sleeve 68 has water courses 74 to allow passage of circulation fluid uphole.
In other alternative embodiments of the present invention, mill shear screw 70 and stabilizer shear screw 72 can be configured so that only mill shear screw 70 is sheared for release of combination mill assembly 62, and both mill shear screw 70 and stabilizer sleeve shear screw 72 are sheared for release of stabilizer sleeve 68 to provide a stronger securement between stabilizer sleeve 68 and cylindrical head 18. It should also be noted that combination mill assembly 62 can be run into wellbore 6 and engaged within cylindrical head 18 by torque pins 48 after removal of a prior mill, such as mill 14, from within wellbore 6.

Referring to Figure 6, a section view, taken along line B--B of Figure 4, depicts string mill 66 assembly 62 of an alternative embodiment of the present invention. String mill 66 has cutting surfaces provided by METAL MUNCHER® buttons 34 and a circulation fluid flow path 76 for passage of circulation fluids.

With reference to Figure 7, a section view taken along line C--C of Figure 4, shows combination mill 64 used in combination mill assembly 62 of an alternative embodiment of the present invention. Combination mill 64 has cutting surfaces provided by METAL MUNCHER® buttons 34 on fixed cutting arms 78. Fixed cutting arms 78 are affixed to combination mill body 80 and extend outward beyond combination mill body 80 for engagement with casing string 4 both to start window 8 into casing string 4, and to cut window 8 through casing string 4. String mill 66, shown in Figure 6, is provided for reaming or enlarging window 8 longitudinally uphole to allow adequate clearance for passage of drillstrings (not shown), and later-run casing strings (not shown) which may be run for casing sidetrack borehole 10, shown in Figure 1.
Referring to Figures 8a, 8b, 8c, and 8d, which are one-quarter longitudinal section views, that, read together, depict anchor packer 24 of the preferred embodiment of the present invention in a released position within wellbore 6. Anchor packer 24 has an upper threaded adapter 102 by which it is secured to safety joint 22 (shown in Figure 1) which is in turn secured to whipstock 20 (also shown in Figure 1). Upper threaded adapter shoulder 104 faces downward between a slotted guide sleeve 106 and mandrel 108. Threaded adapter shoulder 104 is disposed for selectively matingly abutting the upper end of spring housing 110.

A spring housing 110 is disposed about mandrel 108. Spring housing 110 mates with guide pin 111 for sliding engagement with a slotted guide sleeve 106.

A controlled release latch 112 includes a Belleville spring 114, which is disposed inside of spring housing 110, a release ring 116, and a lock ring 118. Lock ring 118 is, in the preferred embodiment of the present invention, a snap ring disposed inside of a connector sleeve 120 which is secured by threads to spring housing 110. A latch shoulder 122 is formed in mandrel 108 between latch groove 124 and a reset groove 126. A retainer shoulder 128 is formed into the connector sleeve 120 by machining retainer groove 130 into the interior of the upper end of connector sleeve 120. Stop shoulder 131 is formed on the lower end of retainer groove 130 and stops lock ring 118 within retainer groove 130. Release groove 132 is formed into the interior of spring housing 110 for retaining Belleville spring 114, which is a biasing member for biasing release ring 116.

Controlled release latch 112 selectively latches mandrel 108 against movement relative to sleeve 134. Sleeve 134, in the preferred
embodiment of the present invention, includes spring housing 110 and connector sleeve 120.

A buttress member 136 is connected by threads to connector sleeve 120 and abuts packing elements 138. Buttress member 140 is secured by threads to booster sleeve 142. Packing elements 138 are squeezed between buttress member 136 and buttress member 140 to energize packing sleeves 138 into sealing engagement with casing string 4.

The lower end of connector sleeve 120 is slotted for receipt of torque pin 144 which prevents rotation between slip-gripping mechanism 145 and connector sleeve 120 for transmission of torque therebetween.

Slip-gripping mechanism 145 includes a slip seat 146, slips 148, and a T-slotted ring 150. Also included as part of slip-gripping mechanism 145 is a ratchet latch assembly 152 which includes a body lock ring 154 secured by threads to booster sleeve 142. A plurality of threaded collets 156 are secured by threads to T-slotted ring 150. Mandrel 108 is further provided with a collet retaining shoulder 158, the function of which is described hereinafter.

Slip elements 148 of slip-gripping mechanism 145 include dimpled gripping buttons 160, which, upon gripping engagement of slips 148 with casing string 4, are the portion of slips 148 which bite into casing 4 to provide the gripping engagement. In the preferred embodiment of the present invention, dimpled gripping buttons 160 have four dimples which provide penetrating surfaces for penetrating into the surface of the interior of casing string 4 and providing the gripping engagement.
Slip-gripping mechanism 145 further includes a T-slot swivel 162, and a swivel wire 164. A slip stabilizer sleeve 165 maintains alignment of slips 148 with slip seat 146.

In the preferred embodiment of the present invention, slip-gripping mechanism 145 is a flex-lock slip-gripping mechanism as disclosed in U.S. Patent Number 4,711,326, invented by Baugh, et al., and issued on December 8, 1987. Although a flex-lock slip-gripping mechanism is used in the preferred embodiment of the present invention, other embodiments of the present invention may utilize other types of slip-gripping mechanisms for anchoring whipstock 20 within casing string 4.

Anchor packer 24 further includes a drag spring assembly 168 which includes a cage 170 which retains wiper springs 172 in slotted spring retainers 174. A rotation release J-latch 176 is secured to the lower end of drag spring assembly 168.

Rotation release J-latch 176 includes a J-latch ring 178 which has a lower coupling end 180 to which rotation release J-latch collet fingers 182 fasten to releasably secure J-latch collet sleeve 184. J-latch collet sleeve 184 is secured by threads to lower-threaded adapter 186 which is also secured by threads to mandrel 108.

Referring again to Figure 1, the operation of retrievable whipstock system 2 is begun by first securing retrievable whipstock system 2 to workstring 12 and lowering retrievable whipstock system 2 within casing 4 in wellbore 6. Prior to releasing mill 14 from stabilizer sleeve 16, anchor packer 24 is releasably secured within casing 4 after positioning retrievable whipstock system 2 within wellbore 6. Whipstock system 2 may be oriented into position for cutting window 8 and drilling sidetrack borehole 10 by a
measurement-while-drilling measurement device (not shown) run as part of workstring 12.

With reference to Figures 9a, 9b, 9c, and 9d, which are one-quarter longitudinal section views which, read together, depict anchor packer 24 in a first setting position within wellbore 6, after rotation release J-latch 176 has been manipulated to release and to allow slip elements 148 to move relative to slip seat 146. Rotation release J-latch 176 is released by rotating anchor packer 24 to engage drag spring assembly 168 with casing string 4 (not shown in Figures 9a, 9b, 9c and 9d). Frictional engagement between drag spring assembly 168 and casing string 4 (not shown in Figures 9a, 9b, 9c, and 9d) causes drag spring assembly 168 and J-latch ring 178 to rotate with respect to rotation release J-latch collet fingers 182 and J-latch collet sleeve 184, which rotates with mandrel 108 and workstring 12 (not shown in Figures 9a, 9b, 9c, and 9d). Rotation of J-latch ring 178 with respect to J-latch collet sleeve 184 for one revolution, in the preferred embodiment of the present invention, uncouples rotation release J-latch collet fingers 182 from coupling end 180 of J-latch ring 178.

Referring to Figure 10, a detailed view depicts rotation release J-latch 176 and shows rotation release J-latch collet finger 182 selectively coupled to coupling end 180 of rotation release J-latch ring 178. Coupling end 180 includes a groove 188 and retaining lip 190. Rotation release J-latch collet fingers 182 are inserted into groove 188 and have a shoulder which abuts a shoulder of coupling end 180 to maintain rotation release J-latch 176 in latching engagement.

With reference to Figures 11, 12 and 13, three cross-sectional views depict the operation of rotation release J-latch 176 of the preferred embodiment of the present invention as it is operated to selectively uncouple
slip elements 148 of slip-gripping mechanism 145 for relative movement and engagement with slip seat 146. Retaining lip 190 is shown having lip window 192 next to cam member 194. Lip window 192 is included as part of a J-latch collet pathway 196 for rotation release J-latch collet fingers 182 to travel through as they disengage and release from groove 188. As anchor packer 24 and mandrel 108 are rotated, collet fingers 182 are rotated about coupling groove 188 which is held in place within casing 4 (not shown in Figures 11, 12, and 13) by drag spring assembly 168 (not shown in Figures 11, 12, and 13). Cam member 194 is rotated about J-latch collet fingers 182 and urges them to pass through lip window 192 and rest exterior of retaining lip 190 so that the shoulders of J-latch collet fingers 182 are no longer in latching engagement with the shoulders of coupling end 180 (shown in Figure 10 in a latching engagement).

Referring again to Figure 10, in the preferred embodiment of the present invention, J-latch collet fingers 182 may be re-engaged within groove 188 of coupling end 180 by moving collet fingers 182 longitudinally upward into groove 188. J-latch collet fingers 182 will act as leaf springs and pull the shoulder of collet fingers 182 into latching engagement with the shoulder of coupling end 180 to secure slip elements 148 from moving relative to slip seat 146 and prevent setting of slip-gripping mechanism 145 (not shown in Figure 10).

Referring to Figure 14, a perspective view is shown of a J-latch assembly 198 which is an alternative embodiment to rotation release J-latch 176. Figure 14 shows alternative J-latch assembly 198 in an uncoupled position. Alternative J-latch assembly 198 has J-hooks 200 which secure to J-hook lugs 202 to prevent movement of slip elements 204 with respect to slip seat 206 to prevent setting of slip-gripping assembly 208. In other
embodiments of the present invention, other types of J-latch assemblies may be used.

It should be noted, however, that for operation of alternative J-latch assembly 198, workstring 12 must be both moved longitudinally and rotated for both latching and unlatching of alternative J-latch assembly 198. Referring to Figure 8d, the rotation release J-latch 176 of the preferred embodiment of the present invention, however, is released by rotation of workstring 12, and is latched by longitudinal movement of workstring 12. Including rotation release latch 176 in the preferred embodiment of the present invention simplifies operational procedures for setting anchor packer 24 within casing string 4 over operational procedures that would be required if alternative J-latch assembly 198 were included in the preferred embodiment of the present invention.

Referring to Figures 9a, 9b, 9c and 9d, once rotation release J-latch 176 is uncoupled, anchor packer 24 may be lowered downhole to move slip seat 146 into engagement with slips 148 and to urge slips 148 into gripping engagement with casing string 4 (not shown in Figures 9a, 9b, 9c, and 9d).

When slip-gripping mechanism 145 is urged into gripping engagement, upper threaded adapter 102 and mandrel 108 are urged downwardly, and threaded adapter shoulder 104 presses into the upper end of spring housing 110. Movement of mandrel 108 latches controlled release latch 112 by engaging lock ring 118 between latch groove 124 and retainer groove 130.

With reference to Figure 15, a partial, one-quarter, longitudinal section view is depicted of anchor packer 24 in a second setting position within wellbore 6, showing ratchet latch 152 being urged into a first latching
position as slip elements 148 of slip-gripping mechanism 145 are urged to move relative to slip seat 146 and into gripping engagement with casing 4. Collet retaining shoulder 158 of mandrel 108 has been urged downward and adjacent to threaded collets 156 to maintain threaded collets 156 in threaded engagement with body lock ring 154. Threaded collets 156 can move upward with respect to body lock ring 154 and collet retaining shoulder 158 maintains threaded collets 156 in threaded engagement with body lock ring 154. Ratchet latch assembly 152 maintains engagement between slips 148 and slip seat 146 of slip-gripping mechanism 145.

Referring to Figure 16, a partial one-quarter longitudinal section view depicts anchor 24 in a third setting position, showing ratchet latch 152 in a second latching position for retaining sealing energization of packing sleeves 138 (not shown in Figure 16). Threaded collet 156 has been urged further upward with respect to body lock ring 154 and is maintained in threaded engagement by collet-retaining shoulder 158 of mandrel 108.

Ratchet latch assembly 152 latches slips 148 stationary relative to slip seat 146 to maintain slip-gripping mechanism 145 in gripping engagement, and maintains buttress member 136 stationary relative to buttress member 140 to maintain sealing energization of packing sleeves 138 (not shown in Figure 16). Ratchet latch assembly 152 is released by upward movement of mandrel 108 to remove collet retaining shoulder 158 from mating abutment with threaded collets 156. Movement of collet retaining shoulder 158 upward allows threaded collets 156 to flex inward and disengage from body lock ring 154 so that they are no longer in a threaded, ratcheting engagement.

Referring to Figure 9a, controlled release latch 112 is latched to maintain mandrel 108 in a set position with respect to sleeve 134, which
maintains collet retaining shoulder 158 in mating abutment with to threaded
collets 156. Mandrel 108 is moved upward by releasing controlled release
latch 112 so that mandrel 108 can move upward with respect to both sleeve
134 and threaded collets 156. Controlled release latch 112 is released by
pulling upward on mandrel 108 with a predetermined force as slip-gripping
mechanism 145 is in gripping engagement with casing 4. In the preferred
embodiment of the present invention, this force is determined by the strength
of Belleville spring 114. In the preferred embodiment of the present
invention, 50,000 pounds of force is required to release controlled release
latch 112 to allow mandrel 108 to move upward with respect to sleeve 134 and
threaded collets 156.

The operation of controlled release latch 112 is depicted in
Figures 17, 18, 19 and 20. With reference to Figure 17, a partial sectional
view depicts controlled release latch 112 with lock ring 118 in an unlatched
position. Belleville spring 114 is shown between mandrel 108 and sleeve 134.
Release ring 116 is below and biased by Belleville spring 114, and is disposed
in release groove 132. Lock ring 118 is disposed in reset groove 126 and
retainer groove 130.

Referring to Figure 18, a partial section view shows controlled
release latch 112 with lock ring 118 disposed in a latched position. Mandrel
108 has moved downward so that lock ring 118, which is a snap ring in the
preferred embodiment, is disposed in latch groove 124 abutting latch shoulder
122 and also abutting release ring 116. Retainer shoulder 128 of sleeve 134
prevents lock ring 118 from expanding radially outward to allow latch shoulder
122 to pass. Belleville springs 114 bias release ring 116 to press downward on
lock ring 118 as lock ring 118 is pushed upward by latch shoulder 122 of
mandrel 108.
With reference to Figure 19, a partial sectional view depicts controlled release latch 112 with lock ring 118 disposed in a released position. Figure 19 depicts lock ring 118 after it has been urged upward by latch shoulder 122 of mandrel 108 to press against release ring 116 with enough force to compress belleville spring 114. When a predetermined amount of force, which in the preferred embodiment of the present invention is 50,000 pounds, compresses Belleville spring 114, release ring 116 moves upward, allowing movement of lock ring 118 past retainer shoulder 128 of sleeve 134 so that lock ring 118 may be urged radially outward by latch shoulder 122 and into release groove 132. Once lock ring 118 is urged radially outward by the upward force of latch shoulder 122 of mandrel 108, latch shoulder 122 is no longer in abutment with lock ring 118 and is free to move longitudinally upward with respect to lock ring 118. Mandrel 108 then moves upward with respect to sleeve 134.

Referring to Figures 8a, 8b, 8c, and 8d, in the preferred embodiment of the present invention, once mandrel 108 moves longitudinally upward with respect to sleeve 134, ratchet latch 152 is released by collet retaining shoulder 158 of mandrel 108 moving upward and out of mating abutment with threaded collet 156 to allow threaded collet 156 to flex inward and out of threaded engagement with body lock ring 154.

Referring to Figure 20, a partial sectional view depicts controlled release latch 112 with lock ring 118 disposed in a reset position. Lock ring 118 is shown having snapped back into a reduced radial dimension by the elasticity of lock ring 118 contracting lock ring 118 into reset groove 126. Latch shoulder 122 has moved past lock ring 118 so that lock ring 118 has clearance to move into reset groove 126. Belleville spring 114 pushes downward on release ring 116 which in turn pushes downward on lock ring 118, urging lock ring 118 past retainer shoulder 128 of sleeve 134. Release
ring 116 then slides downward within release groove 132 and pushes lock ring 118 downward between reset groove 126 and retainer groove 130 toward stop shoulder 131 of sleeve 134. Lock ring 118 is then urged into the unlatched position as shown in Figure 17.

Once controlled release latch 112 is again in an unlatched position with lock ring 118 disposed between reset groove 126 and retainer groove 130 as shown in Figure 17, it can be again relatched to position mandrel 108 in a latched position with respect to sleeve 134 and lock ring 118 as shown in Figure 18. Ratchet assembly 152 then can be reset, and slip-gripping mechanism 145 repositioned in gripping engagement with casing 4. Anchor packer 24 can be set, released, and then reset in gripping engagement with casing 4, allowing retrievable whipstock system 2 to be set at one position and orientation within wellbore 6, then released and moved and repositioned at a different location and orientation within wellbore 6.

Referring now to Figure 21, 22, 23 and 24, the operation of retrievable whipstock system 2 is depicted in several longitudinal section views which show mill 14 cutting window 8 through casing string 4. Figure 21 is a longitudinal section view of retrievable whipstock system 2 showing mill 14 after it has been sheared free of stabilizer sleeve 16 to start cutting window 8 into casing string 4.

Figure 22 is a longitudinal section view showing mill 14 after it has cut a portion of window 8 downward along whipstock 20. Mill 14 is shown as having started to cut sidetrack borehole 10. Whipstock 20 has a deflector surface which guides mill 14 as it cuts window 8 in casing 4 and starts cutting sidetrack borehole 10.
Figure 23 shows retrievable whipstock system 2 after mill 14 has cut window 8 downward along the deflector surface of whipstock 20, and is now being pulled upward to ream out the top of window 8. Mill 14 must enlarge window 8 longitudinally upward so that there will be sufficient clearance for a later run drillstring and casing (not shown) to pass from wellbore 6, through window 8, and downward into sidetrack borehole 10.

Figure 24 is a longitudinal section view showing mill 14 after it is finished cutting window 8 and has been retracted and pulled back up into stabilizer sleeve 16. From this position, further pulling upward on mill 14 shears stabilizer sleeve 16 free from cylindrical head 18 of whipstock 20 so that mill 14, stabilizer sleeve 16, and workstring 12 may be removed, or tripped-out of wellbore 6.

With reference to Figure 25, a detailed view of Figure 21 shows mill 14 as it is starting to cut window 8. The deflector surface of whipstock 20 is directing mill 14 to cut window 8 into casing 4. Hydraulically expandable arms 26 have been expanded outward by circulation fluids as mill 14 is rotated to urge METAL MUNCHER® buttons 34 to cut into casing 4. As mill 14 is rotated, the upper portion is engaged within stabilizer sleeve 16 which restricts lateral movement of mill 14 to reduce vibration of METAL MUNCHER® buttons 34 and extend their service life.

Referring to Figure 26, a detailed view of Figure 22 shows mill 14 cutting the lower portion of window 8. Here, METAL MUNCHER® buttons 34 of mill nose 28 are cutting the lower portion of window 8.

With reference to Figure 27, a detailed view of Figure 3 shows mill 14 as it is pulled upward and rotated to ream out and enlarge longitudinally upward casing window 8. METAL MUNCHER® buttons 34 on
the upper portion of hydraulically expandable arms 26 now are cutting the upper portion of window 8 into casing string 4.

Referring now to Figure 28, a detailed view of Figure 24 depicts mill 14 after it has been pulled back up into engagement within stabilizer sleeve 16. Hydraulically expandable arms 26 now are retracted and mill 14 is within cylindrical head 18. A further upward pull on mill 14 will shear stabilizer sleeve 16 from cylindrical head 18 and mill 14, and stabilizer sleeve 16, and workstring 12 can be removed from wellbore 6.

After removal of mill 14 and stabilizer sleeve 16 from wellbore 6, a drillstring then can be run down into the wellbore and passed through cylindrical head 18 to drill sidetrack borehole 10. In addition, another mill, such as mill 14, or combination mill assembly 62, or other wellbore tools, could be run and engaged into cylindrical head 18. Cylindrical head 18 is keyed with torque pins 48 so that a slotted wellbore tool can be oriented with torque pins 48 and thus within cylindrical head 18 and whipstock 20.

A conventional fishing spear may be run for retrieving whipstock 20 and anchor packer 24. The fishing spear can be a full-circle spear for engagement with cylindrical head. Anchor packer 24 now can be released from gripping engagement, and either retrieved from wellbore 6, or repositioned and reset in gripping engagement within wellbore 6.

In an alternative embodiment of the present invention, a non-retrievable whipstock system may be run which is permanently set within wellbore 6. If a non-retrievable whipstock system is to be run, anchor packer 24 with controlled release latch 112 may be replaced with a permanent anchor, or a permanent packer. Additionally, a slip-gripping mechanism may
be run without a packing sleeve for sealing between the whipstock system and wellbore casing 4.

In another embodiment of the present invention, a retrievable whipstock system may be utilized having an anchor packer that does not include a controlled release latch 112, but rather includes 50,000 pounds of drill collars suspended below a slip-gripping mechanism for retaining a whipstock within wellbore 6 until an upward pull of 50,000 pounds is applied to the slip-gripping mechanism. However, anchor packer 24 with controlled release latch 112 may be run in deviated, or even horizontal wellbores, to provide a release latch for releasing anchor packer 24 upon application of a predetermined force. The amount of release force required to release controlled release latch 112, and to release slip-gripping mechanism 145 and anchor packer 24, is determined by the size of Belleville spring 114 which may be easily changed to vary the amount of force required for releasing controlled release latch 112.

Other embodiments of the present invention may include a retrievable whipstock system having a controlled release latch 112 requiring a smaller predetermined force for releasing slip-gripping mechanism 145 than is required for shearing stabilizer sleeve 16 from cylindrical head 18. If an alternative embodiment is run with controlled release latch 112 requiring a lesser predetermined force for release than is required to shear stabilizer sleeve 16 from cylindrical head 18, retrievable whipstock system 2 then can be utilized to mill several windows, such as window 8, through casing string 4 on a single trip into the wellbore. Retrieved whipstock system 2 can be run into wellbore 6 and set in casing 4, and mill 14 operated to cut window 8 through casing string 4. Then, controlled release latch 112 can be released to release slip-gripping mechanism 145 and free anchor packer 24 from securement within casing string 4. The retrievable whipstock system 2 can be
repositioned within wellbore 6, and even oriented by a measurement device such as utilized in measurement-while-drilling systems, and then reset. Mill 14 can be utilized again to cut another window in casing string 4. Then retrievable whipstock system can be released, repositioned, reoriented, and reset within wellbore 6.

The retrievable whipstock system of the present has several advantages over prior-art systems. The retrievable whipstock system can be run with an orientation device, such as a measurement-while-drilling tool, for determining the positioning and orientation of the retrievable whipstock system within a wellbore. The retrievable whipstock system of the present invention can be set in position, released, repositioned and reoriented within the wellbore, and then reset again. Additionally, the anchor packer of the retrievable whipstock system is releasable by application of a predetermined force, and then is resettable.

The cylindrical head provides a full-circle surface so that greater torque and linear force can be applied from the workstring to the whipstock. Additionally, it is easier to fish for the full-circle opening of the cylindrical head, allowing use of full-circle spears to engage workstring with whipstock.

During milling, a stabilizer sleeve is supported within the cylindrical head so that the retrievable whipstock system can better guide the mill and can prevent damaging vibration to the mill than if a mere deflector surface of the whipstock were provided. This greatly extends the service life of the mill.

Further, by using METAL MUNCHER® buttons, the service life of the mill is also extended. By extending mill service life, utilization of the retrievable whipstock system of the present system allows a window to be fully
cut through a wellbore casing for drilling a sidetrack borehole in a single trip into the well bore. This greatly reduces the length of time it takes to complete wellsite operations for cutting a window, thereby saving expensive rig time.

Further, by using torque members in the cylindrical head, other tools and stabilizer sleeves having slotted members may be run and keyed to orient within the retrievable whipstock system.

While the invention has been shown in only one of its forms, it is not thus limited, but is susceptible to various changes and modifications without departing from the scope and spirit thereof.
CLAIMS

What is claimed is:

1. A whipstock system for use in a wellbore for cutting a window through a casing wall for passage of a drillstring for drilling a sidetrack borehole, said whipstock system comprising:

   a mill included as a lower portion of a workstring for cutting said window into said casing wall;

   a whipstock securable within said casing, and having a deflector surface for directing said mill into said casing wall for cutting said window and directing said drillstring through said window for drilling said sidetrack borehole;

   a cylindrical head affixed around a first end of said whipstock and circumferentially disposed about said workstring for selectively securing said workstring to said whipstock for transmission of torque and axial force therebetween; and

   a whipstock anchor for securing said whipstock within said casing.
2. The whipstock system of claim 1, wherein said mill for cutting said window comprises:

   a combination mill for both starting said window into said casing wall, and milling said window through said casing wall; and

   a reamer for enlarging said window longitudinally along said casing for providing longitudinal clearance for passage of said drillstring from said casing, through said window, and into said sidetrack borehole.

3. The whipstock system of claim 1, wherein said mill for cutting said window comprises:

   a hydraulically expanding mill for starting said window into said casing wall, milling said window through said casing wall, and enlarging said window through said casing wall for passage of said drillstring from said casing into said sidetrack borehole.
4. The whipstock system of claim 1, wherein said cylindrical head further comprises:

at least one torque pin for selectively mating with a slotted member secured to said workstring to transfer torque between said workstring and said whipstock; and

at least one shear member pin for selectively securing said workstring to said whipstock to position and set said whipstock within said casing.

5. The whipstock system of claim 1, further comprising:

a stabilizer sleeve selectively secured within said cylindrical head for dampening lateral movement of said mill during cutting of said window, at least during an initial engagement of said mill with said casing.
6. The whipstock system of claim 1, further comprising:

   a stabilizer sleeve for selectively securing said mill within said cylindrical head to transfer a plurality of forces therebetween;

   a torque member for selectively securing said stabilizer sleeve within said cylindrical head to transfer torque therebetween;

   a first shear member, for selectively securing said mill within said stabilizer sleeve to transfer a longitudinal force from said workstring to said whipstock to position and set said whipstock within said casing, said first shear member selectively releasable by application of a first predetermined force after setting said whipstock anchor;

   a second shear member for selectively securing said stabilizer sleeve within said cylindrical head to transfer a force therebetween until application of a second predetermined force; and

   a clearance between said mill and said stabilizer sleeve to permit rotation of said mill and for transferring a plurality of radial forces from said cylindrical head, through said stabilizer sleeve, and to said mill for reducing lateral movement of said mill at least during initial milling of said window said casing wall.
7. The whipstock system of claim 1, further comprising:

   a retrieving spear for selectively securing said workstring to said cylindrical head for transmission of a predetermined longitudinal force for releasing said whipstock anchor, and for retrieving said whipstock from said wellbore.

10 8. The whipstock system of claim 1, further comprising:

   a safety joint securing said whipstock to said whipstock anchor, said safety joint selectively separable by application of a predetermined force for removal of said whipstock from said wellbore independent of said whipstock anchor.

9. The whipstock system of claim 1, wherein said whipstock anchor includes an elastomeric packing element which is energized into a fluid-sealing engagement between said casing and said whipstock anchor.
10. The whipstock system of claim 1, wherein said whipstock anchor further comprises:

    a controlled release latch for releasing said whipstock anchor from securing said whipstock within said casing, said controlled release latch selectively releasable by application of a predetermined force to said whipstock anchor.

11. The whipstock system of claim 1, wherein said whipstock anchor comprises:

    a controlled release latch which is selectively settable, releasable, and resettable for selectively securing said whipstock within said casing.
12. The whipstock system of claim 1, wherein said whipstock anchor comprises:

   a mandrel;

   a slip-gripping mechanism having a slip seat and a plurality of longitudinally extending slip elements which are urged into a gripping engagement with said casing by relative movement between said slip elements and said slip seat;

   a ratchet latch which maintains said slip-gripping mechanism in said gripping engagement with said casing, said ratchet latch including a plurality of collets which are retained in a latching engagement by a mandrel selectively positioned relative said plurality of collets; and

   a controlled release latch which is selectively latchable for latching said mandrel in a latched position for maintaining said collets in said latching engagement, and said controlled release latch is selectively releasable for releasing said mandrel from said latched position to release said collets from said latching engagement and release said slip-gripping mechanism from said gripping engagement.
13. A whipstock system for use in a wellbore for cutting a window through a casing wall through which a sidetracked borehole is drilled, said whipstock system comprising:

a mill for starting said window, milling said window through said casing wall, and reaming said window for passage of a sidetrack borehole drillstring on a single trip into said wellbore;

a whipstock for lowering into a wellbore on a workstring, and releasably securing within said casing, said whipstock having a guide surface for directing said mill into said casing wall in cutting said window and directing said sidetrack borehole drillstring through said window;

a whipstock anchor secured to an end of said whipstock for releasably securing said whipstock within said wellbore, said whipstock anchor releasable by application of linear force of a predetermined amount; and

a cylindrical head affixed to another end of said whipstock for selectively securing said workstring to said whipstock for transmission of torque and linear force therebetween, said workstring securable to said cylindrical head by a plurality of connecting components including:

a stabilizer sleeve for transmission of linear force in a radial direction within said wellbore for stabilizing motion of said mill at least during said starting of cutting said window;

a retrieval spear for transmission of linear force longitudinally within said wellbore for releasing and retrieving said whipstock; and
torque members for transferring torque between said stabilizer sleeve and said cylindrical head.
14. A whipstock anchor for releasably securing a whipstock within a wellbore, said whipstock anchor comprising:

a mandrel;

a sleeve concentrically disposed about said mandrel;

a slip-gripping mechanism disposed about said mandrel and having a plurality of slips and a slip seat, said slip seat being moveable relative to said plurality of slips for matingly engaging and urging said plurality of slips to extend radially into gripping engagement with said wellbore to secure said sleeve and said whipstock within said wellbore;

a slip release latch for releasing said slips for movement relative to said slip seat to set said slip-gripping mechanism into gripping engagement within said wellbore;

a controlled release latch which is selectively settable, releasable, and resettable for releasably engaging said mandrel against movement relative to said sleeve, said mandrel being positionable in a plurality of positions, which include a latched position and an unlatched position, by a manipulation of said mandrel; and
a ratchet latch for latching said slip seat and said plurality of slips in said set position in gripping engagement with said casing, said ratchet latch including:

5 a body lock ring secured to said slip seat and having a plurality of ratchet teeth;

a lock sleeve secured to said plurality of slips, said lock sleeve having a plurality of longitudinally extending collets, said collets including a plurality of mating ratchet teeth for mating with said plurality of ratchet teeth of said body lock ring, wherein said body lock ring and said lock sleeve are may be urged into a mating ratchet engagement to allow relative movement between said body lock ring and said lock sleeve in a single longitudinal direction;

10 said mandrel, when disposed in said latched position, positioned about said lock sleeve for retaining said plurality of longitudinally extending collets in said mating ratchet engagement with said body lock ring;

15 said mandrel, when disposed in said unlatched position, no longer retaining said ratchet engagement between said lock sleeve and said body lock ring, and allowing said plurality of longitudinally extending collets to flex away from and disengage from said ratchet engagement with said ratchet teeth; and

20 at least one torque member extending between said mandrel and said slip-gripping mechanism, said torque member connecting a mandrel torque slot to a slip-gripping mechanism torque slot for transmission of torque therebetween.

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15. The whipstock of claim 14, wherein said controlled release latch further comprises:

a lock member having a deformable body concentrically disposed between and selectively moveable between said mandrel and said sleeve for placement in said plurality of positions, including said latched and said unlatched position;

a biasing member abutting at least a portion of said sleeve to exert a biasing force on said lock member in response to, and opposing, a directional force exerted upon said lock ring in said latched position;

a latch member laterally extending from said mandrel towards said sleeve for selective engagement in a mating abutment with said lock member for transferring said directional force from said mandrel, through said latch member to said lock member in said latched position, and to said biasing member and said sleeve;

a retainer shoulder laterally extending from said sleeve towards said mandrel for retaining said lock member in said latched position in said mating abutment with said latch member by preventing deformation of said lock member;

wherein application of a directional force of a predetermined amount to said lock member displaces said lock member against said biasing member, moving said lock ring effectively aside of said retainer member and allowing said deformation, which places said lock ring effectively aside of said latch member, releasing said controlled release latch to permit relative motion between said mandrel and said sleeve; and
wherein said controlled release latch is repeatedly operable within said wellbore for repositioning said lock ring in said latched position, releasably reconnecting said mandrel and said sleeve.
16. The whipstock of claim 14, wherein said slip release latch is a rotation release latch wherein said latch is released by rotation of said mandrel within said wellbore about said sleeve as said sleeve is held stationary by a drag spring assembly, said rotation release latch including:

at least one coupling member secured to said slips and having a coupling shoulder circumferentially disposed about said coupling member;

a slip latching member secured to said slip seat and having a plurality of slip latching arms which each include a slip latching shoulder, said slip latching shoulders each extending from said slip latching collet arms for insertion into a slip latching position wherein each of said slip latching shoulders extend for matingly engaging with at least one of said at least one coupling shoulders for preventing movement between said slips and said slip seat; and

a cam member circumferentially disposed about said coupling member for urging said slip latching shoulders to an unlatched position by rotation of said cam member with respect to said slip latching member to selectively uncouple said slips from said slip seat, wherein in said slip unlatched position said slip latching shoulder is radially displaced from said slip latching position with said coupling shoulder, and said slip seat is moveable relative to said plurality of slips for securing said sleeve and said whipstock within said wellbore.
17. The whipstock of claim 14, wherein said plurality of slips included in said whipstock anchor have a plurality of dimpled hard metal inserts which are urged to grippingly engage said casing to secure said sleeve and said whipstock within said wellbore.
18. A singular mill for use in a wellbore for cutting a window in a casing wall for passage of a drillstring for drilling a sidetrack borehole, said singular mill comprising a plurality of cutting surfaces for, in a single trip into said wellbore, starting said window into said casing wall, and milling said window through said casing wall.

19. The singular mill of claim 18, wherein said plurality of cutting surfaces, in said single trip into said wellbore, further mill said window in said casing wall to ream and longitudinally enlarge said window for passage of said drillstring.

20. The singular mill of claim 18, further comprising:

   a stabilizer sleeve which is secured within said wellbore for dampening lateral movement of said plurality of cutting surfaces for extending a service life of said mill.
21. An expandable mill for use in a wellbore for cutting a window in a casing wall for passage of a drillstring for drilling a sidetrack borehole, said expandable mill comprising a plurality of cutting surfaces for, in a single trip into said wellbore, starting said window into said casing wall, and milling said window through said casing wall.

22. The expandable mill of claim 18, wherein said plurality of cutting surfaces, in said single trip into said wellbore, further mill said window in said casing wall to ream and longitudinally enlarge said window for passage of said drillstring.

23. The expandable mill of claim 18, further comprising:

a stabilizer sleeve which is secured within said wellbore for dampening lateral movement of said plurality of cutting surfaces for extending a service life of said mill.
24. A controlled release latch for use in a wellbore tool for latching a
mandrel and a sleeve to selectively prevent relative movement therebetween
until an application of a predetermined force, said controlled release latch
comprising:

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a pathway defined between said mandrel and said sleeve, said sleeve
having a plurality of cam surfaces which include a latch surface on said
mandrel, and a retention surface and a stop surface on said sleeve;

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a biasing member for opposing said relative motion between said
mandrel and said sleeve by application of a biasing force;

a lock member disposed between said mandrel and said sleeve, and
which includes a plurality of follower surfaces for selective positioning in a
plurality of positions which include:

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a latching position in abutting engagement with said latch surface to
prevent said relative motion between said mandrel and said sleeve, said
lock member in engagement with said retention surface for maintaining
said mating abutment with said latch surface, said lock member being
biased by said biasing member;

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a release position wherein said biasing member exerts pressing a force
on said lock member equal to said predetermined force, and wherein
said lock member is positioned aside of said retained engagement with
said retention surface and said mating abutment with said latch surface,
said released position allowing said relative movement between said
mandrel and said sleeve;
a reset position to move said lock member from said release position to an unlatched position wherein said lock member abuts said stop surface; and

5 said unlatch position wherein said lock ring abuts said stop surface and is positioned for reengagement in said mating abutment with said latch surface without removal of said wellbore tool from a wellbore.
25. A controlled release latch for use within a wellbore tool for releasably connecting a mandrel to a sleeve within a wellbore, said controlled release latch comprising:

a lock member having an elastically deformable body concentrically disposed and selectively moveable between said mandrel and said sleeve for placement in a plurality of positions, including a latched and an unlatched position;

abiasing member buttressed by a portion of said sleeve for exertion of a biasing force to said lock ring in response to, and opposing, a directional force exerted upon said lock ring in said latched position;

a latch member laterally extending from said mandrel towards said sleeve for a selective engagement in a mating abutment with said lock member for transferring said directional force from said mandrel, through said latch member to said lock member in said latched position, and to said biasing means and said sleeve;

a retainer shoulder laterally extending from said sleeve towards said mandrel for retaining said lock member in said latched position in said mating abutment with said latch member by preventing said elastic deformation of said lock member;

wherein application of said directional force in a predetermined amount to said lock member displaces said lock member against said biasing member, moving said lock ring effectively aside of said retainer member and allows said elastic deformation, which places said lock ring effectively aside of said latch member, to permit relative motion between said mandrel and said sleeve; and
wherein said controlled release latch is repeatedly operable within said wellbore for repositioning said lock ring in said latched position, releasably reconnecting said mandrel to said sleeve.
26. A controlled release latch for use in a wellbore tool for latching a mandrel and a sleeve to prevent a relative movement therebetween until a predetermined force is applied to said mandrel and said sleeve for unlatching said controlled release latch, said controlled release latch comprising:

a lock member concentrically disposed between said mandrel and said sleeve and positionable in a plurality of positions which include: a latch position for preventing said relative movement between said mandrel and said sleeve, a release position for allowing said relative movement between said mandrel and said sleeve, a reset position for allowing said controlled release latch to be reset for downhole relatching, and an unlatch position for allowing a second relative movement between said mandrel and said sleeve;

a latch shoulder laterally extending from said mandrel towards said sleeve for a mating abutment with said lock member when said lock member is in said latch position;

a retainer shoulder laterally extending from said sleeve towards said mandrel for maintaining lock member in said lock position in said mating abutment with said latch shoulder by preventing a lateral displacement of said lock member towards said sleeve and away from said latch shoulder prior to displacement of said lock member to said release position;

a biasing member disposed about said lock member for providing a biasing force to said lock member in said latch position for opposing a force from said latch shoulder urging a longitudinal displacement of said latch member towards said release position, said biasing member defined for providing an amount of said biasing force to said lock member which is equivalent to an amount of said predetermined force acting on said lock member during displacement into said release position, in which lock member
displaces aside of said retainer shoulder and said latch shoulder and out of said mating abutment with said latch shoulder to allow said relative movement between said mandrel and said sleeve; and

a reset clearance disposed between said mandrel and said sleeve across said retaining shoulder from said biasing means, and further disposed between said mandrel and said retaining shoulder after said relative movement displaces said latch shoulder aside of said lock member, said reset clearance providing a pathway for allowing said lock member to be urged a reset position and further to an unlatched position for resetting and relatching of said controlled release latch without requiring removal of said wellbore tool from a wellbore.
27. A controlled release latch for use in a wellbore tool for latching a mandrel and a sleeve to prevent a relative movement therebetween until a predetermined force is applied to said mandrel and said sleeve for unlatching said controlled release latch, said controlled release latch comprising:

a latch shoulder laterally extending from said mandrel towards said sleeve;

a retainer shoulder laterally extending from said sleeve towards said mandrel;

a biasing member disposed concentrically between said mandrel and said sleeve for providing a biasing force which opposes and, at least in part, prevents said relative movement of said mandrel relative to said sleeve;

a reset clearance disposed between said mandrel and said sleeve across said retaining shoulder from said biasing means, and further disposed between said mandrel and said retaining shoulder after said relative movement displaces latch shoulder with respect to said retainer shoulder;

a lock member concentrically disposed between said mandrel and said sleeve, and having features, which in combination with features of said latch shoulder, said retainer shoulder, said biasing member, and said reset clearance, allowing selective positioning in a plurality of positions which include:

a latch position with said latch shoulder in mating abutment for preventing said relative movement between said mandrel and said sleeve, said retainer shoulder preventing a lateral displacement towards said sleeve and away from said latch shoulder to maintain said mating
abutment with said latch shoulder, and said biasing member providing said biasing force to prevent a displacement aside of said retainer shoulder and said latch shoulder;

a release position being urged by both said biasing member, which provides an amount of said biasing force equivalent to said predetermined force, and said predetermined force which is urging said lock member against said biasing member to displace said lock member aside of said release shoulder and aside of said latch shoulder for allowing said relative movement between said latch shoulder; and

a reset position being urged to pass through a reset clearance which provides a pathway to moved to an unlatched position; and

said unlatch position for allowing a second relative movement between said mandrel and said sleeve, and for allowing resetting and relatching of said controlled release latch without requiring removal of said wellbore tool from a wellbore.
28. A controlled release latch for use in a wellbore tool for latching a mandrel and a sleeve to prevent a relative movement therebetween until a predetermined force is applied to said mandrel and said sleeve for unlatching said controlled release latch, said controlled release latch comprising:

a lock ring concentrically disposed between said mandrel and said sleeve, said lock ring defined for selectively positioning in a plurality of positions which include: a latch position, a release position, a reset position, and an unlatch position;

a latch shoulder defined on said mandrel between a latch groove and a reset groove formed into said mandrel, said latch shoulder radially extending towards said sleeve and further defined for a mating abutment with said lock ring in said latch position and displacement of said lock ring aside for said lock ring disposed in said release position and said unlatch position;

a retainer shoulder defined on said sleeve between said release groove and said retainer groove formed into said sleeve, and radially extending towards said mandrel, said retainer shoulder further defined for maintaining said lock ring in said mating abutment with said latch shoulder, and displacement of said lock ring aside in said release and reset positions;

a stop shoulder formed into said sleeve by said retainer groove on an opposite side of said retainer groove from said retainer shoulder, said stop shoulder extending from said sleeve towards said mandrel and further defined for preventing movement of said lock ring in said unlatch position; and

a biasing member concentrically disposed about said retainer shoulder between said mandrel and said sleeve for providing said biasing force in an opposing direction to a direction of said predetermined force, and said biasing
member further defined for providing a biasing force to said lock ring in said release position equivalent in amount to said predetermined force.
29. The controlled release latch of claim 25, wherein said mandrel, said sleeve, said lock ring, said release ring, and said biasing member include features for operation and said resetting of said controlled release latch by selectively positioning said lock ring in said plurality of positions, said plurality of positions further including:

said latch position having said lock ring disposed within said latch groove and between latch shoulder, said retainer shoulder, and said release ring, in a mating abutment with said latch shoulder for preventing said relative movement between said mandrel and said sleeve, said lock ring maintained in said mating abutment by said retainer shoulder preventing a radial displacement between said lock ring and said latch shoulder, and said lock ring urged by said biasing force from said release ring and said biasing member which prevents said lock ring from a longitudinal displacement aside of said retainer shoulder until said latch shoulder pushes against said lock ring with said predetermined force which is opposed to said biasing force;

said release position having said lock ring disposed between said release ring and said retainer shoulder, and displaced aside of said latch shoulder and said latch groove and within said release groove for allowing said relative movement between said mandrel and said sleeve, wherein application of said predetermined force urges said mandrel to push said latch shoulder into said lock ring and longitudinally displaces said bias member to allow said lock ring to longitudinally displace aside of said retainer shoulder, which provides clearance for said lock ring to displace radially aside of said latch shoulder and release from said mating abutment with said latch shoulder, which further provides clearance for said latch shoulder to move aside of said lock ring wherein said lock ring and said latch shoulder are no longer longitudinally positioned for said mating abutment, and said mandrel and said sleeve are urged into said relative movement;
said reset position having said lock ring disposed within said reset
groove about said mandrel and disposed aside of said retainer shoulder and
said release groove, said reset groove providing clearance for allowing a
secondary biasing means to urge said lock ring to displace about said retainer
shoulder to said retainer groove and further to an unlatch position; and

said unlatch position having said lock ring disposed outside of said latch
groove and within said retainer groove with said stop shoulder preventing
movement of said lock ring, and said retainer groove providing a relatch
clearance for said latch shoulder to pass about said lock ring for resetting of
said controlled release latch by repositioning said lock ring within said latch
groove for further preventing said relative movement between said mandrel
and said housing until a repeated application of said predetermined force.
30. A method of cutting a window in a casing wall for passage of a drillstring for drilling a sidetrack borehole, said method comprising the steps of:

5 lowering a retrievable whipstock system into said wellbore;

positioning said retrievable whipstock system in a desired position and direction within said wellbore;

10 anchoring said retrievable whipstock system within said wellbore;

releasing a mill by shearing a pin to allow linear movement and rotation of said mill;

15 starting said window in said casing wall by rotating said mill, and preventing lateral movement of said mill by dampening vibrations with a stabilizer sleeve at least during said starting of said window;

milling said window through said casing wall;

20 reaming said window through said casing wall to enlarge said window for passage of said drillstring for drilling said sidetrack borehole;

retrieving said mill from said wellbore; and

25 running a retrievable spear into said wellbore for selective securement to said whipstock, releasing said whipstock from said casing, and retrieving said whipstock from said wellbore.
31. A whipstock system for use in a wellbore to cut a window through a casing wall through which a sidetracked borehole is drilled, said whipstock system comprising:

a whipstock for lowering into a wellbore on a workstring and securing within a casing which includes said casing wall, said whipstock having a first end for releasibly securing to said workstring to lower said whipstock within said wellbore, a second end, and a guide surface for directing a mill into said casing wall in cutting said window and for directing a drillstring through said window;

a whipstock anchor secured to said second end of said whipstock for lowering into said wellbore secured to said whipstock and setting to secure said whipstock within said casing, said whipstock anchor including a slip-gripping mechanism having a plurality of slips and a slip seat which is moveable relative to said plurality of slips for matingly engaging and urging said plurality of slips to extend radially for grippingly engaging said casing to secure said whipstock within said wellbore; and

wherein said workstring is mechanically manipulated for urging said slip seat to matingly engage and urge said plurality of slips to radially extend for grippingly engaging said casing to set said whipstock anchor and thus secure said whipstock to said casing on a singular trip within said wellbore.
32. The whipstock system of claim 31, further comprising:

   a cylindrical head affixed around said first end of said whipstock
   for releasibly securing said whipstock to said workstring for lowering said
   whipstock within said wellbore.

33. The whipstock system of claim 32, wherein said cylindrical head
    comprises:

   at least one torque pin for selectively mating with a slotted
   member secured to said workstring to transfer torque between said workstring
   and said whipstock; and

   at least one shear member pin for selectively securing said
   workstring to said whipstock to position and set said whipstock within said
   casing.

34. The whipstock system of claim 31, further comprising:

   a mill included as a lower portion of said workstring for cutting
   said window into said casing wall.
35. The whipstock system of claim 34, further comprising:

a cylindrical head affixed around said first end of said whipstock for releasibly securing said whipstock to said workstring for lowering said whipstock within said wellbore; and

a stabilizer sleeve selectively secured within said cylindrical head for dampening lateral movement of said mill during cutting of said window, at least during an initial engagement of said mill with said casing.

36. The whipstock system of claim 35, wherein said mill is a singular mill for use in said wellbore for cutting said window in said casing wall for passing said drillstring for drilling said sidetrack borehole, and said singular mill comprises:

a plurality of cutting surfaces for, in a single trip into said wellbore, starting said window into said casing wall, and milling said window through said casing wall.

37. The whipstock system of claim 31, wherein said whipstock anchor further comprises:

a drag means for providing a frictional engagement between said slip gripping mechanism and said casing to release and urge said slips to move relative to said slip seat for urging said plurality of slips to radially extend for grippingly engaging said casing to secure said whipstock within said wellbore.
38. The whipstock assembly of claim 37, wherein said drag means comprises:

a drag spring assembly having wiper springs, slotted spring retainers for retaining said wiper springs therein, and a cage which retains said wiper springs in said slotted retainers.

39. The whipstock assembly of claim 37, further comprising a release latch for releasibly securing said slip seat against movement with respect to said plurality of slips until said workstring is manipulated for releasing said slip seat to move with respect to said plurality of slips.

40. The whipstock system of claim 37, further comprising:

a mill included as a lower portion of said workstring for cutting said window into said casing wall; and

a cylindrical head affixed around said first end of said whipstock for releasibly securing said whipstock to said workstring and said mill for lowering said whipstock within said wellbore.
41. A whipstock system for use in a wellbore to cut a window through a casing wall through which a sidetracked borehole is drilled, said whipstock system comprising:

5 a whipstock for lowering into a wellbore on a workstring and releasibly securing within a casing which includes said casing wall, said whipstock having a first end for releasibly securing to said workstring to lower said whipstock within said wellbore, a second end, and a guide surface for directing a mill into said casing wall in cutting said window and for directing a drillstring through said window;

10 a whipstock anchor secured to said second end of said whipstock for lowering into said wellbore, secured to said whipstock and setting to releasibly secure said whipstock within said casing, said whipstock anchor including a slip-gripping mechanism having a plurality of slips and a slip seat which is moveable relative to said plurality of slips for matingly engaging and urging said plurality of slips to extend radially for grippingly engaging said casing to secure said whipstock within said wellbore; and

15 wherein said workstring is mechanically manipulated for urging said slip seat to matingly engage and urge said plurality of slips to radially extend for grippingly engaging said casing to set said whipstock anchor and thus releasibly secure said whipstock within said wellbore.
42. The whipstock assembly of claim 41, wherein said whipstock is released for retrieval from said wellbore by pulling uphole on said whipstock with an upwards force of at least a predetermined force threshold.

43. The whipstock assembly of claim 42, wherein pulling uphole on said whipstock with said force of at least said predetermined force threshold releases said plurality of slips from grippingly engaging said casing to allow removal of said whipstock from said wellbore.

44. The whipstock system of claim 41, further comprising:

   a cylindrical head affixed around said first end of said whipstock for releasibly securing said whipstock to said workstring for lowering said whipstock within said wellbore and for transferring torque between said whipstock and said workstring; and

   a stabilizer sleeve selectively secured within said cylindrical head for dampening lateral movement of said mill during cutting of said window, at least during an initial engagement of said mill with said casing.

45. The whipstock system of claim 41, further comprising:

   a singular mill for use in said wellbore to cut said window in said casing wall to pass said drillstring for drilling said sidetracked borehole, said singular mill comprising a plurality of cutting surfaces for, in a single trip into said wellbore, starting said window into said casing wall, and milling said window through said casing wall.
46. The whipstock system of claim 41, wherein said whipstock anchor further comprises:

   a drag means for providing a frictional engagement between said
   slip gripping mechanism and said casing to release and urge said slips to move
   relative to said slip seat for urging said plurality of slips to radially extend for
   grippingly engaging said casing to secure said whipstock within said wellbore.

47. The whipstock assembly of claim 46, wherein said drag means comprises:

   a drag spring assembly having wiper springs, slotted spring
   retainers for retaining said wiper springs therein, and a cage which retains said
   wiper springs in said slotted retainers.

48. The whipstock assembly of claim 41, further comprising a release latch
   for releasibly securing said slip seat against movement with respect to said
   plurality of slips until said workstring is manipulated for releasing said slip
   seat to move with respect to said plurality of slips.
49. A method of cutting a window in a casing wall of a casing disposed within a wellbore for passing a drillstring to drill a sidetrack borehole, said method comprising the steps of:

providing a whipstock system having a whipstock and a whipstock anchor, said whipstock including a first and second ends, and said whipstock anchor including a drag means, a plurality of slips, and a slip seat;

releasibly securing said first end of said whipstock to a workstring and said whipstock anchor to said second of said whipstock for lowering within said casing;

lowering said whipstock and said whipstock anchor downhole within said casing on a singular trip into said wellbore;

positioning said whipstock and said whipstock anchor in a desired position and direction within said casing for cutting said window in said casing wall; and

anchoring said whipstock within said wellbore by mechanically manipulating said workstring to urge a frictional engagement between said drag means and said casing to release said slips to move relative to said slip seat and urge said plurality of slips to radially extend for grippingly engaging said casing to set said whipstock anchor and thus to secure said whipstock within said casing.
50. The method of claim 49, further comprising the steps of:

further providing said whipstock system with a mill which is releasibly secured to said first end of said whipstock;

releasing said mill from said first end of said whipstock by shearing a pin to allow linear movement and rotation of said mill after setting said whipstock anchor; and

starting said window in said casing wall by rotating said mill, and preventing lateral movement of said mill by dampening vibrations with a stabilizer sleeve at least during said starting of said window.

51. The method of claim 50, further comprising the steps of:

providing said whipstock system with said mill having a starting mill and a reamer; and

on a singular trip within said wellbore, milling said window through said casing wall and reaming said window through said casing wall to enlarge said window for passage of said drillstring for drilling said sidetrack borehole.

52. The method of claim 51, further comprising the step of:

retrieving said whipstock from said wellbore after cutting said window through said casing wall.