SPECIFICATION
**Releasable drill string stabilizer**

This invention relates to a drill string stabilizer for use in oil well drilling operations to aid in drilling directional holes, straight holes and to prevent "sticking" between the drill string and the bore hole by having the blades of the stabilizer prevent the drilling string from contacting the sides of the well bore hole. In the past, stabilizers were made up within the drill string as the string was run into the hole; however, this arrangement has several undesirable features because it adds tool joint connections to the drill string, which increases possible points of failure in the drill string and causes variation in drill collar stand lengths which increases trip time and creates unsafe operational conditions for rig personnel and further requires a special bottom hole assembly which increases drilling costs and does not permit adjustment of the stabilizer along the drill string without changing subs which further increase drilling costs.

The use of lock-on stabilizers has been suggested to solve these undesirable aspects. Typically, the lock-on stabilizer has a body with externally extending blades, two end caps for connecting to the body, an inside solid locking ring and two outside solid locking rings with a single tapered surface for each ring. The stabilizer is connected between pin and box joints on the drill string by positioning the inside locking ring inside the body, thereafter positioning an outside locking ring on either end of and with the tapered surface facing the inside locking ring. Two end caps are used to force the rings together within the body to connect the stabilizer to the drill string. A major difficulty with this arrangement has been its inability to be reused after once being attached. This difficulty is caused by the inherent inability of the solid rings to clamp around the drill string without being deformed.

As further set forth in U.S. Patent No. 3,916,998, U.S. Patent No. 4,101,179 and U.S. Patent No. 4,105,262, combinations of split rings and/or wedging clamps are used for attaching the stabilizers to the drill string.

It is one object of the present invention to provide a stabilizer of simple and inexpensive construction which can be releasably connected to a drill string.

According to the present invention a drill string stabilizer comprising a stabilizer body having an interior surface and an exterior surface including outwardly extending stabilizer blades, engaging means mounted on the interior surface of the stabilizer body for tightly engaging the drill string, urging means mounted with said stabiliser body for continuously urging said engaging means to tightly engage the drill string, and rotation stop means extending through said stabilizer body to said engaging means to prevent rotational movement of said engaging means and to prevent movement of said stabilizer body relative to said engageing means.

The invention can be performed in various ways but one embodiment will now be described by way of example and with reference to the accompanying drawings in which:

Figure 1 is an elevational view partly in section showing a stabilizer according to the present invention installed on a drill string in a well;

Figure 2 is an enlarged elevational view partly in section illustrating a detailed construction of the invention shown in Figure 1; and,

Figure 3 is a partial cross-section taken along A—A of Figure 2.

As illustrated in Figure 1, a drilling string 10 is positioned within bore hole 12 which bore hole 12 is formed by drilling bit 14 in a manner well known in the art. As is also well known, when the drilling bit 14 drills a bore hole 12 deeper within the earth formation, it is necessary to add a drill collar 16, which is secured to the drilling string 10 by conventional pin and box joints as at 20. As illustrated, the stabilizer of the present invention is generally designated by the numeral 22 and is secured to drill collar 16, however, it is to be undestood that many stabilizers or multiple stabilizers may be attached to the drill string at any desired elevation.

As illustrated in Figure 2, stabilizer 22 includes a stabilizer body 24 having stabilizer blades 26 extending outwardly therefrom to contact the sides of the well bore 12 (Figure 1). Stabilizer 22 also includes end caps 28 and 30, clamping wedges 32 and 34, a plurality of spring means 36 and 38 and pin means 40 and 42.

Stabilizer body 24 includes a central section 44 having an interior surface 46 which contacts drill collar 16. On either side of the central interior surface 46 are two oppositely tapered surfaces 48 and 50 extending away from the central section interior surface 46. Each of the tapered surfaces 48 and 50 extends outwardly to interior thread sections 52 and 54, respectively.

As best illustrated in Figure 2, stabilizer blades 26 extend outwardly to contact the well bore 12 as is well known in the art and extend substantially the longitudinal length of the stabilizer body 24 and are integrally connected at each end with the exterior ends 56 and 58, respectively, of respective interior threaded sections 52 and 54.

Each of the end caps 28 and 30 includes a collar 60 for mounting around the drill string 16 and a plurality of exterior threads 62 for threadedly engaging with threads 52 and 54, respectively, of the stabilizer body 24. A cap retainer lip or member 64 is mounted on the end of the thread sections 62 and forms a slotted section 66 defined by the lip or extension 64 and corner or edge 68 of the end cap 60.

Clamping wedge members 32 and 34 include interior surface 70, including a plurality or multiplicity of serrations or teeth 72 for tightly gripping the drill string 16. The exterior surface 74 of the wedge members 32 and 34 includes a tapered surface area 76 which complimentary matches the tapered surface 48 and 50,

respectively, of stabilizer body 24 adjacent the teeth 72 to form a wedge shaped section 78. The exterior surface 74 also includes section or portion 80 which includes a spring retaining and receiving slot 82 formed by the lip 84 and edge 86. As illustrated in Figure 2, the lip 84 overlaps with the lip 64 of end cap 16 to retain wedge members 32 and 34 in position, as will be set forth hereinbelow.

A plurality of wave spring means or other suitable type springs means 36 and 38, respectively, and positioned in the retaining slot 82 to continually force the wedge members 32 and 34 toward the centre section 46 of stabilizer body 24 which thus causes the wedge shape members 32 and 34 to tightly grip the drill collar 16.

As fully illustrated in Figure 2, each of the wedge shape members 32 and 34 extends partially around the drill collar 16 such that each longitudinal end 85 defines a longitudinal gap 87, and are forced toward each other to narrow such gap 87 as the members 32 and 34 tightly grip the string 16.

As fully illustrated in Figures 2 and 3, pin means 42 and 40 are inserted through openings 88 adjacent each end (not numbered) of the blades 26 which opening 88 extends through the stabilizer body 24. Pins 90 are inserted into the openings and welded as at 92 to the stabilizer body 24 to prevent movement of the stabilizer body, the wedge members 32 and 34 and cap members 28 and 30, respectively, relative to each other.

As further illustrated, such pin means 42 defined by pin 90 extends into openings 88 so that the head 90*a* is inserted therein and a retainer section 90*b*, which is of a smaller diameter than head 90*a*, extends through opening 88 and into the gap 86 formed by the longitudinal ends 85 of the member 32 and 34. It should be understood that the retainer section 90*b* does not extend past the interior surface 70 of wedge members 30 and 32, which thus prevents wear and tear of pin members 40 and 42 adjacent the drill collar 16.

As end caps 28 and 30 are tightened to the threaded interior section of body 24, spring means 36 and 38 are compressed, which causes the spring means 36, 38 to exert force on the edge 86 to force wedge members 32 and 34 toward central section 44 of body 24. Tightening of end caps 28 and 30 or rotation of the drill string 16 causes the end caps 28 and 38 and body 24 to rotate such that the longitudinal end 84 of members 32 and 34 engage the corner 90*c* formed by the intersection of head 90*a* and end 90*b* to prevent movement of the wedge members 30 and 32 relative to body 24 and end caps 28 and 30.

In this manner, once the stabilizer 22 is assembled as hereinabove described, and the teeth 72 tightly grip the drill string 16 due to the urging of the spring means 36 and 38 urging the clamping means 32 and 34, respectively, toward the central section 44 of stabilizer body 24 to enable the teeth 72 to tightly grip the drill string, then movement of the stabilizer body 24 relative to different parts of the stabilizer body and the drill string 16 is prevented.

CLAIMS

1. A drill string stabilizer comprising a stabilizer body having an interior surface and an exterior surface including outwardly extending stabilizer blades, engaging means mounted on the interior surface of the stabilizer body for tightly engaging the drill string, urging means mounted with said body for continuously urging said engaging means to tightly engage the drill string, and rotation stop means extending through said stabilizer body to said engaging means to prevent rotational movement of said engaging means and to prevent movement of said stabilizer body relative to said engageing means.

2. A drill string stabilizer as claimed in claim 1 in which the interior surface of each end of said stabilizer body has screw threads and tapered surfaces which extend from each of said threads to a middle portion of said stabilizer body, and end cap mounted on each end of said stabilizer body having exterior threads on one end for threadedly engaging one of each of said set of threads on the end of said stabilizer body, and an end cap retainer slot formed on the interior of each of said end caps, said slot being positioned on the interior threaded end, at least one clamping wedge for each end of said stabilizer body, which has an interior surface provided with teeth for gripping the drill string, an exterior surface having a tapered surface complimentary matching and adjacent said tapered surfaces of said stabilizer body and said exterior surface further including a spring retaining and receiving slot and a retaining lip section, said lip section extending into and being received by said end cap retainer slot for retaining said wedge in position relative to said stabilizer body and drill string; spring means mounted in said spring retaining and receiving slot for tightly retaining each of said clamps relative to said stabilizer body and for forcing each of said clamps inwardly toward each other to enable said tapered surface of each of said wedges to slide on the respective tapered surfaces of said stabilizer body to cause said wedges to tightly engage said drilling string, and pin means extending through said stabilizer body and contacting said clamping wedge to prevent movement of said wedge, stabilizer body and end cap relative to each other.

3. A drill string stabilizer as claimed in claim 2 in which said pin means includes a retainer end extending outwardly through said stabilizer body wherein one longitudinal end of each of said

respectively, of stabilizer body 24 adjacent the teeth 72 to form a wedge shaped section 78. The exterior surface 74 also includes section or portion 80 which includes a spring retaining and receiving slot 82 formed by the lip 84 and edge 86. As illustrated in Figure 2, the lip 84 overlaps with the lip 64 of end cap 16 to retain wedge members 32 and 34 in position, as will be set forth hereinbelow.

A plurality of wave spring means or other suitable type springs means 36 and 38, respectively, and positioned in the retaining slot 82 to continually force the wedge members 32 and 34 toward the centre section 46 of stabilizer body 24 which thus causes the wedge shape members 32 and 34 to tightly grip the drill collar 16.

As fully illustrated in Figure 2, each of the wedge shape members 32 and 34 extends partially around the drill collar 16 such that each longitudinal end 85 defines a longitudinal gap 87, and are forced toward each other to narrow such gap 87 as the members 32 and 34 tightly grip the string 16.

As fully illustrated in Figures 2 and 3, pin means 42 and 40 are inserted through openings 88 adjacent each end (not numbered) of the blades 26 which opening 88 extends through the stabilizer body 24. Pins 90 are inserted into the openings and welded as at 92 to the stabilizer body 24 to prevent movement of the stabilizer body, the wedge members 32 and 34 and cap members 28 and 30, respectively, relative to each other.

As further illustrated, such pin means 42 defined by pin 90 extends into openings 88 so that the head 90*a* is inserted therein and a retainer section 90*b*, which is of a smaller diameter than head 90*a*, extends through opening 88 and into the gap 86 formed by the longitudinal ends 85 of the member 32 and 34. It should be understood that the retainer section 90*b* does not extend past the interior surface 70 of wedge members 30 and 32, which thus prevents wear and tear of pin members 40 and 42 adjacent the drill collar 16.

As end caps 28 and 30 are tightened to the threaded interior section of body 24, spring means 36 and 38 are compressed, which causes the spring means 36, 38 to exert force on the edge 86 to force wedge members 32 and 34 toward central section 44 of body 24. Tightening of end caps 28 and 30 or rotation of the drill string 16 causes the end caps 28 and 38 and body 24 to rotate such that the longitudinal end 84 of members 32 and 34 engage the corner 90*c* formed by the intersection of head 90*a* and end 90*b* to prevent movement of the wedge members 30 and 32 relative to body 24 and end caps 28 and 30.

In this manner, once the stabilizer 22 is assembled as hereinabove described, and the teeth 72 tightly grip the drill string 16 due to the urging of the spring means 36 and 38 urging the clamping means 32 and 34, respectively, toward the central section 44 of stabilizer body 24 to enable the teeth 72 to tightly grip the drill string, then movement of the stabilizer body 24 relative to different parts of the stabilizer body and the drill string 16 is prevented.

## CLAIMS

1. A drill string stabilizer comprising a stabilizer body having an interior surface and an exterior surface including outwardly extending stabilizer blades, engaging means mounted on the interior surface of the stabilizer body for tightly engaging the drill string, urging means mounted with said body for continuously urging said engaging means to tightly engage the drill string, and rotation stop means extending through said stabilizer body to said engaging means to prevent rotational movement of said engaging means and to prevent movement of said stabilizer body relative to said engageing means.

2. A drill string stabilizer as claimed in claim 1 in which the interior surface of each end of said stabilizer body has screw threads and tapered surfaces which extend from each of said threads to a middle portion of said stabilizer body, and end cap mounted on each end of said stabilizer body having exterior threads on one end for threadedly engaging one of each of said set of threads on the end of said stabilizer body, and an end cap retainer slot formed on the interior of each of said end caps, said slot being positioned on the interior threaded end, at least one clamping wedge for each end of said stabilizer body, which has an interior surface provided with teeth for gripping the drill string, an exterior surface having a tapered surface complimentary matching and adjacent said tapered surfaces of said stabilizer body and said exterior surface further including a spring retaining and receiving slot and a retaining lip section, said lip section extending into and being received by said end cap retainer slot for retaining said wedge in position relative to said stabilizer body and drill string; spring means mounted in said spring retaining and receiving slot for tightly retaining each of said clamps relative to said stabilizer body and for forcing each of said clamps inwardly toward each other to enable said tapered surface of each of said wedges to slide on the respective tapered surfaces of said stabilizer body to cause said wedges to tightly engage said drilling string, and pin means extending through said stabilizer body and contacting said clamping wedge to prevent movement of said wedge, stabilizer body and end cap relative to each other.

3. A drill string stabilizer as claimed in claim 2 in which said pin means includes a retainer end extending outwardly through said stabilizer body wherein one longitudinal end of each of said

clamping wedges contact said retainer end to prevent rotational movement of said wedging clamp on said drill string.

4. A drill string stabilizer substantially as described herein with reference to and as shown in the accompanying drawings.

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