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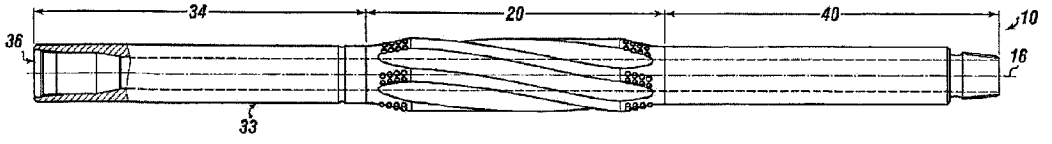
(54) **Titre : STABILISATEUR EXCENTRIQUE BIDIRECTIONNEL**
(54) **Title: BIDIRECTIONAL ECCENTRIC STABILIZER**



(57) **Abrégé/Abstract:**
A drilling rig has a bidirectional eccentric stabilizer for use in a wellbore. The bidirectional eccentric stabilizer is coupled between a drill string and a bottom hole assembly. The bidirectional eccentric stabilizer has a shaft connected between a first shaft end and a second shaft end, an annulus formed longitudinally through the shaft and a cutting portion formed on an outer surface of the shaft. The cutting portion has a first cutting portion, a second cutting portion, a plurality of helical blades, a plurality of flutes, a plurality of cutting nodes, and a plurality of impact arrestors. The bidirectional eccentric stabilizer has a center of eccentric rotation which is offset from the longitudinal axis of the shaft, enabling the bidirectional eccentric stabilizer to form a larger wellbore than a drill bit on the bottom hole assembly and a larger diameter wellbore than originally drilled by the drill bit.

ABSTRACT OF DISCLOSURE

A drilling rig has a bidirectional eccentric stabilizer for use in a wellbore. The bidirectional eccentric stabilizer is coupled between a drill string and a bottom hole assembly. The bidirectional eccentric stabilizer has a shaft connected between a first shaft end and a second shaft end, an annulus formed longitudinally through the shaft and a cutting portion formed on an outer surface of the shaft. The cutting portion has a first cutting portion, a second cutting portion, a plurality of helical blades, a plurality of flutes, a plurality of cutting nodes, and a plurality of impact arrestors. The bidirectional eccentric stabilizer has a center of eccentric rotation which is offset from the longitudinal axis of the shaft, enabling the bidirectional eccentric stabilizer to form a larger wellbore than a drill bit on the bottom hole assembly and a larger diameter wellbore than originally drilled by the drill bit.

CLAIMS

What is claimed is:

1. A drilling rig having a bidirectional eccentric stabilizer for use in a wellbore, wherein the bidirectional eccentric stabilizer is coupled between a downhole drill string and a bottom hole assembly, comprising:

a. the drilling rig comprising:

i. a tower having a crown with sheaves;

ii. a drawworks connected to a drawworks motor and connected to a power supply;

iii. a cable extending from the drawworks through the sheaves over the crown;

iv. a lifting block connected to the cable;

v. a hydraulic pump connected to a tank for flowing fluid into the wellbore as a drill pipe is turned into the wellbore;

vi. a rotating means for turning the drill pipe into the wellbore, the rotating means comprising at least one of: a top drive or a power swivel mounted to the lifting block or a rotary table mounted to a rig floor for rotating the drill pipe into the wellbore;

vii. a blowout preventer connected between the rotating means and the wellbore for receiving the drill pipe;

b. the bidirectional eccentric stabilizer comprising:

i. a shaft connected between a first shaft end and a second shaft end, wherein the shaft comprises an outer diameter with the first shaft end and the second shaft end centered around a longitudinal axis of the bidirectional eccentric stabilizer;

ii. an annulus formed longitudinally through the shaft, wherein the annulus is configured for wellbore fluid flow; and

iii. a cutting portion formed on an outer surface of the shaft, the cutting portion comprising:

(a) a first cutting portion extending at a first cutting angle to a first apex from the first shaft end;

(b) a second cutting portion extending at a second cutting angle to a second apex from the second shaft end, the second cutting portion forming a slightly larger outer diameter for the second cutting portion as the second cutting portion extends away from the second shaft end;

(c) a plurality of helical blades longitudinally connected eccentrically between the first cutting portion and the second cutting portion, each helical blade of the plurality of helical blades existing in a plane parallel to the longitudinal axis of the bidirectional eccentric stabilizer, and each helical blade of the plurality of helical blades comprising a smooth blade surface;

(d) a plurality of flutes formed between pairs of helical blades of the plurality of helical blades;

(e) a plurality of cutting nodes installed on at least one edge of the first cutting portion, on at least one edge of the second cutting portion, or on at least one edge of the first cutting portion and on at least one edge of the second cutting portion; and

(f) a plurality of impact arrestors, each impact arrestor of the plurality of impact arrestors mounted in a location either directly adjacent each cutting node of the plurality of cutting nodes on the first cutting portion, directly adjacent each cutting node of the plurality of

cutting nodes on the second cutting portion or in both locations; and

wherein the bidirectional eccentric stabilizer couples into the downhole drill string and the bidirectional eccentric stabilizer has a center of eccentric rotation which is offset from the longitudinal axis of the bidirectional eccentric stabilizer, enabling the bidirectional eccentric stabilizer to form a larger wellbore than a drill bit on the bottom hole assembly and a larger diameter wellbore than originally drilled by the drill bit.

2. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the bidirectional eccentric stabilizer is a dual eccentric bidirectional stabilizer.

3. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein each helical blade of the plurality of helical blades has an identical longitudinal length.

4. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the plurality of helical blades comprise 4 to 16 helical blades each extended longitudinal length along the shaft of the bidirectional eccentric stabilizer.

5. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the plurality of helical blades comprise multiple helical blades with each helical blade of the plurality of helical blades having an identical thickness.

6. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the plurality of helical blades comprise multiple helical blades with each helical blade of the plurality of helical blades having alternating thicknesses.

7. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the end portion and the nose portion range in length from 25 percent to 35 percent of a total length of the bidirectional eccentric stabilizer.

8. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the plurality of impact arrestors comprises at least one of: a tungsten carbide arrestor, a ceramic impact arrestor, a polycrystalline diamond impact arrestor, and a

diamond impregnated impact arrestor.

9. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, comprising a plurality of cutting elements, wherein the plurality of cutting elements comprises at least one of: a diamond impregnated cutting element and a polycrystalline diamond cutting element, and wherein the plurality of cutting elements are mounted either directly on a face of the plurality of helical blades or on at least one edge of the plurality of helical blades.

10. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, comprising at least one diamond enhanced hardfacing disposed on least one of: a portion of each helical blade, an entire helical blade, and an area surrounding each impact arrestor.

11. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, comprising from 1 impact arrestor to 60 impact arrestors per bidirectional stabilizer, each impact arrestor of the plurality of impact arrestors configured to simultaneously perform as a shock dampener and as a cutting element.

12. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein each impact arrestor of the plurality of impact arrestors is either flush mounted in the cutting portion or slightly raised above a surface of the cutting portion or the plurality of helical blades and extend from the surface less than the plurality of cutting nodes extend from the surface.

13. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, further comprising a plurality of cutting buttons mounted on at least one of: an edge of each helical blade, cutting portions adjacent the plurality of cutting nodes, and a surface of each helical blade.

14. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the first cutting portion and the second cutting portion are installed at the first cutting angle and the second cutting angle ranging from 20 degrees to 55 degrees from the longitudinal axis of the bidirectional eccentric stabilizer.

15. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the smooth blade surface of each helical blade of the plurality of helical blades has a wrap angle forming a particle flow path between pairs of helical blades of the plurality of helical blades without intersecting more than thirty percent of any one helical blade and configured with a line of sight parallel to the longitudinal axis of the bidirectional eccentric stabilizer.

16. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein an outer radius of the cutting portion is greater than or equal to ¼ of an inch of a blade depth as measured from a flute trough to reduce hang-up in the wellbore; and an inner radius of the cutting portion is greater than or equal to ⅛ of an inch of the blade depth as measured from the flute trough to reduce stress on the bottom hole assembly.

17. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the plurality of flutes are configured with a first bypass area greater than or equal to thirty-five percent of a bit diameter for drill bits having an outer diameter of 10 and ⅝ inches or greater or a second bypass area greater than or equal to twenty five percent of a bit diameter for drill bits having an outer diameter less than 10 and ⅝ inches.

18. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, comprising in the bidirectional eccentric stabilizer: a plurality of cutting inserts mounted on at least one of: an edge of each helical blade of the plurality of helical blades, the first and second cutting portions adjacent the plurality of cutting nodes, and a surface of each helical blade and wherein the plurality of cutting inserts are disposed on the surface of each helical blade without extending from the surface of each helical blade more than 0.5 percent of a blade depth.

19. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 17, comprising: at least one nozzle diverting a portion of drilling fluid from the annulus to the plurality of flutes, the at least one nozzle oriented at an angle from 0 degrees to 90 degrees from the longitudinal axis of the bidirectional eccentric stabilizer.

CLAIMS

What is claimed is:

1. A drilling rig having a bidirectional eccentric stabilizer for use in a wellbore, wherein the bidirectional eccentric stabilizer is coupled between a downhole drill string and a bottom hole assembly, comprising:

a. the drilling rig comprising:

i. a tower having a crown with sheaves;

ii. a drawworks connected to a drawworks motor and connected to a power supply;

iii. a cable extending from the drawworks through the sheaves over the crown;

iv. a lifting block connected to the cable;

v. a hydraulic pump connected to a tank for flowing fluid into the wellbore as a drill pipe is turned into the wellbore;

vi. a rotating means for turning the drill pipe into the wellbore, the rotating means comprising at least one of: a top drive or a power swivel mounted to the lifting block or a rotary table mounted to a rig floor for rotating the drill pipe into the wellbore;

vii. a blowout preventer connected between the rotating means and the wellbore for receiving the drill pipe;

b. the bidirectional eccentric stabilizer comprising:

i. a shaft connected between a first shaft end and a second shaft end, wherein the shaft comprises an outer diameter with the first shaft end and the second shaft end centered around a longitudinal axis of the bidirectional eccentric stabilizer;

ii. an annulus formed longitudinally through the shaft, wherein the annulus is configured for wellbore fluid flow; and

iii. a cutting portion formed on an outer surface of the shaft, the cutting portion comprising:

(a) a first cutting portion extending at a first cutting angle to a first apex from the first shaft end;

(b) a second cutting portion extending at a second cutting angle to a second apex from the second shaft end, the second cutting portion forming a slightly larger outer diameter for the second cutting portion as the second cutting portion extends away from the second shaft end;

(c) a plurality of helical blades longitudinally connected eccentrically between the first cutting portion and the second cutting portion, each helical blade of the plurality of helical blades existing in a plane parallel to the longitudinal axis of the bidirectional eccentric stabilizer, and each helical blade of the plurality of helical blades comprising a smooth blade surface;

(d) a plurality of flutes formed between pairs of helical blades of the plurality of helical blades;

(e) a plurality of cutting nodes installed on at least one edge of the first cutting portion, on at least one edge of the second cutting portion, or on at least one edge of the first cutting portion and on at least one edge of the second cutting portion; and

(f) a plurality of impact arrestors, each impact arrestor of the plurality of impact arrestors mounted in a location either directly adjacent each cutting node of the plurality of cutting nodes on the first cutting portion, directly adjacent each cutting node of the plurality of

cutting nodes on the second cutting portion or in both locations; and

wherein the bidirectional eccentric stabilizer couples into the downhole drill string and the bidirectional eccentric stabilizer has a center of eccentric rotation which is offset from the longitudinal axis of the bidirectional eccentric stabilizer, enabling the bidirectional eccentric stabilizer to form a larger wellbore than a drill bit on the bottom hole assembly and a larger diameter wellbore than originally drilled by the drill bit.

2. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the bidirectional eccentric stabilizer is a dual eccentric bidirectional stabilizer.

3. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein each helical blade of the plurality of helical blades has an identical longitudinal length.

4. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the plurality of helical blades comprise 4 to 16 helical blades each extended longitudinal length along the shaft of the bidirectional eccentric stabilizer.

5. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the plurality of helical blades comprise multiple helical blades with each helical blade of the plurality of helical blades having an identical thickness.

6. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the plurality of helical blades comprise multiple helical blades with each helical blade of the plurality of helical blades having alternating thicknesses.

7. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the end portion and the nose portion range in length from 25 percent to 35 percent of a total length of the bidirectional eccentric stabilizer.

8. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the plurality of impact arrestors comprises at least one of: a tungsten carbide arrestor, a ceramic impact arrestor, a polycrystalline diamond impact arrestor, and a

diamond impregnated impact arrestor.

9. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, comprising a plurality of cutting elements, wherein the plurality of cutting elements comprises at least one of: a diamond impregnated cutting element and a polycrystalline diamond cutting element, and wherein the plurality of cutting elements are mounted either directly on a face of the plurality of helical blades or on at least one edge of the plurality of helical blades.

10. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, comprising at least one diamond enhanced hardfacing disposed on least one of: a portion of each helical blade, an entire helical blade, and an area surrounding each impact arrestor.

11. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, comprising from 1 impact arrestor to 60 impact arrestors per bidirectional stabilizer, each impact arrestor of the plurality of impact arrestors configured to simultaneously perform as a shock dampener and as a cutting element.

12. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein each impact arrestor of the plurality of impact arrestors is either flush mounted in the cutting portion or slightly raised above a surface of the cutting portion or the plurality of helical blades and extend from the surface less than the plurality of cutting nodes extend from the surface.

13. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, further comprising a plurality of cutting buttons mounted on at least one of: an edge of each helical blade, cutting portions adjacent the plurality of cutting nodes, and a surface of each helical blade.

14. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the first cutting portion and the second cutting portion are installed at the first cutting angle and the second cutting angle ranging from 20 degrees to 55 degrees from the longitudinal axis of the bidirectional eccentric stabilizer.

15. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the smooth blade surface of each helical blade of the plurality of helical blades has a wrap angle forming a particle flow path between pairs of helical blades of the plurality of helical blades without intersecting more than thirty percent of any one helical blade and configured with a line of sight parallel to the longitudinal axis of the bidirectional eccentric stabilizer.

16. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein an outer radius of the cutting portion is greater than or equal to ¼ of an inch of a blade depth as measured from a flute trough to reduce hang-up in the wellbore; and an inner radius of the cutting portion is greater than or equal to ⅛ of an inch of the blade depth as measured from the flute trough to reduce stress on the bottom hole assembly.

17. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, wherein the plurality of flutes are configured with a first bypass area greater than or equal to thirty-five percent of a bit diameter for drill bits having an outer diameter of 10 and ⅝ inches or greater or a second bypass area greater than or equal to twenty five percent of a bit diameter for drill bits having an outer diameter less than 10 and ⅝ inches.

18. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 1, comprising in the bidirectional eccentric stabilizer: a plurality of cutting inserts mounted on at least one of: an edge of each helical blade of the plurality of helical blades, the first and second cutting portions adjacent the plurality of cutting nodes, and a surface of each helical blade and wherein the plurality of cutting inserts are disposed on the surface of each helical blade without extending from the surface of each helical blade more than 0.5 percent of a blade depth.

19. The drilling rig having a bidirectional eccentric stabilizer for use in a wellbore of claim 17, comprising: at least one nozzle diverting a portion of drilling fluid from the annulus to the plurality of flutes, the at least one nozzle oriented at an angle from 0 degrees to 90 degrees from the longitudinal axis of the bidirectional eccentric stabilizer.

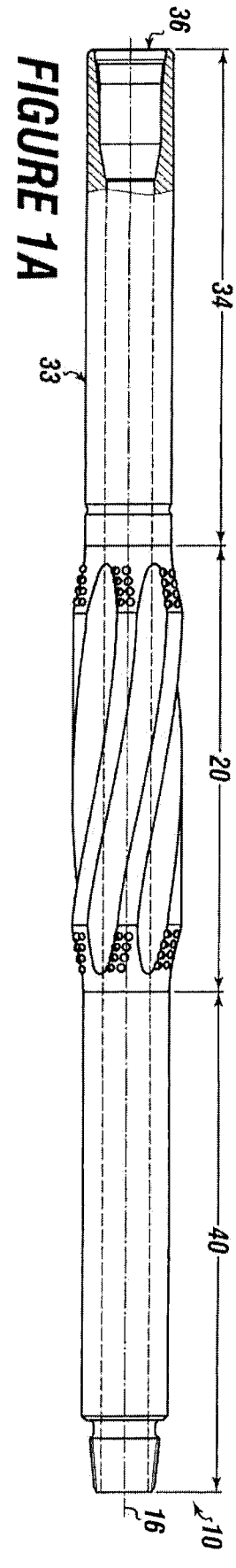


FIGURE 1A

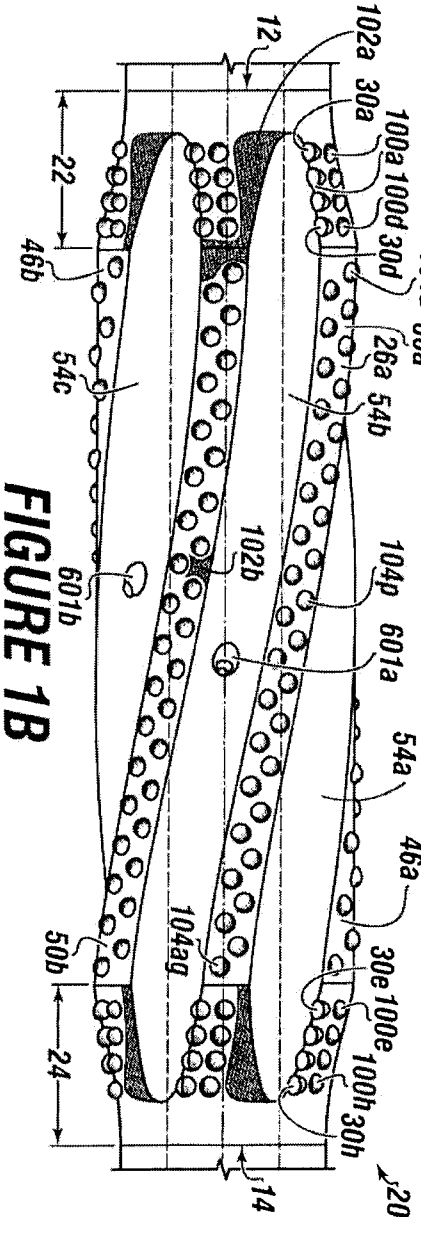


FIGURE 1B

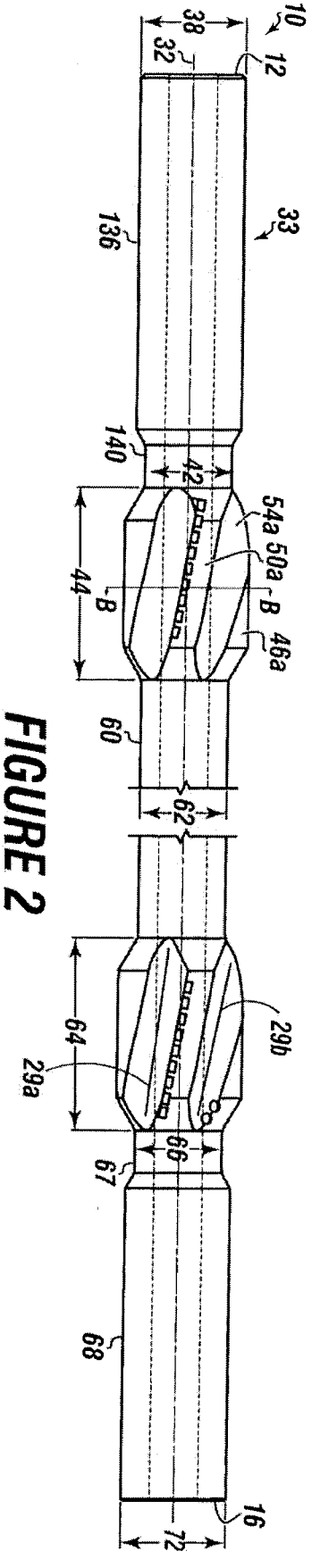


FIGURE 2

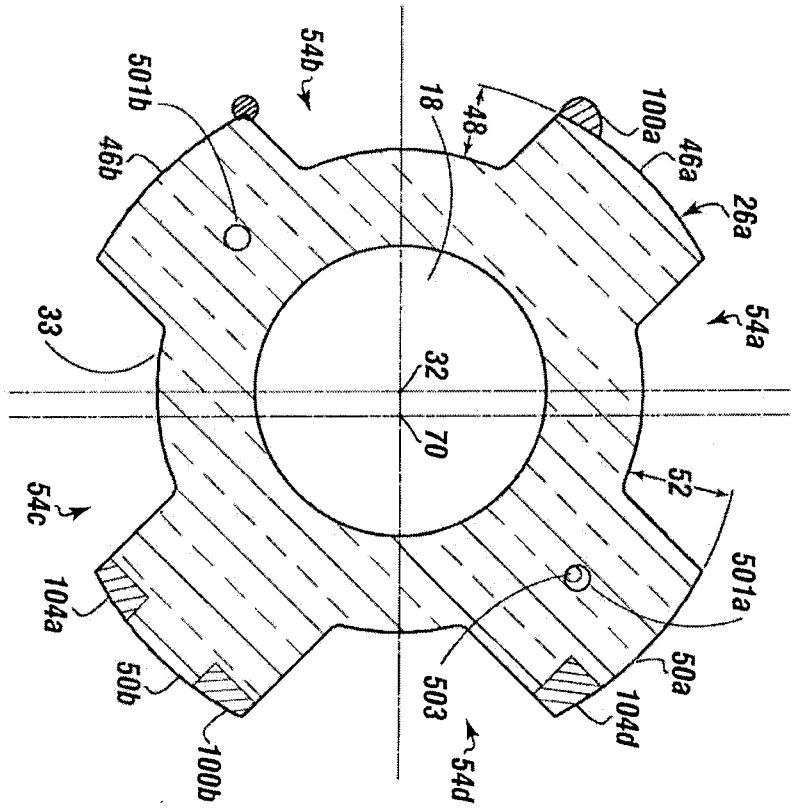


FIGURE 3A

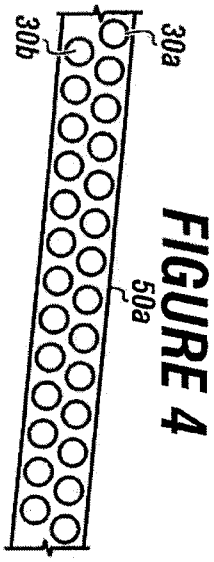


FIGURE 4

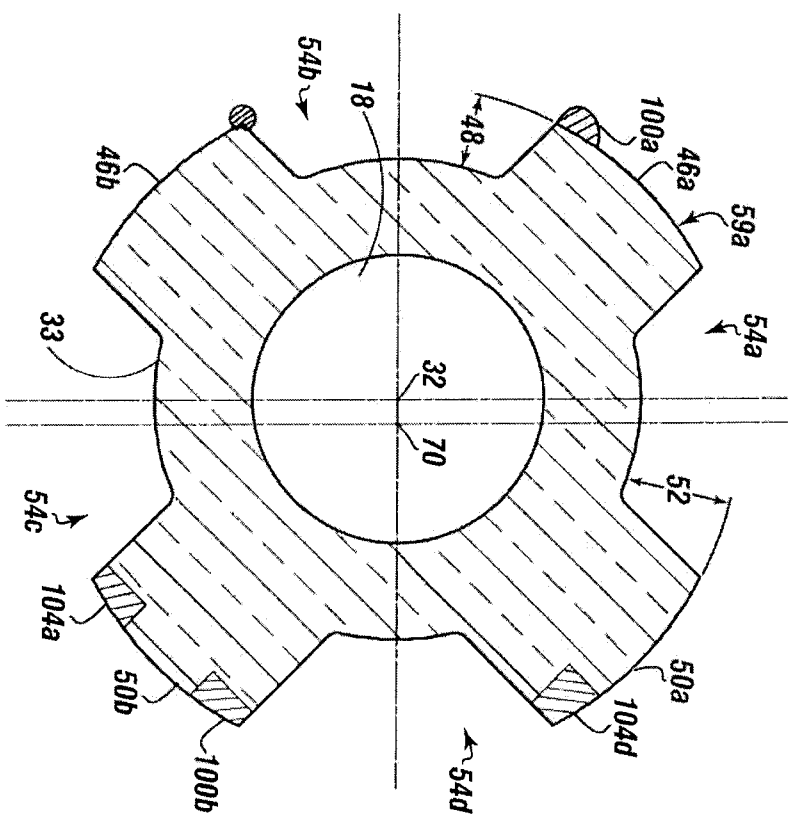


FIGURE 3B

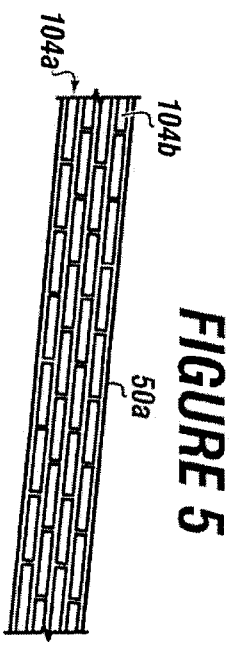


FIGURE 5

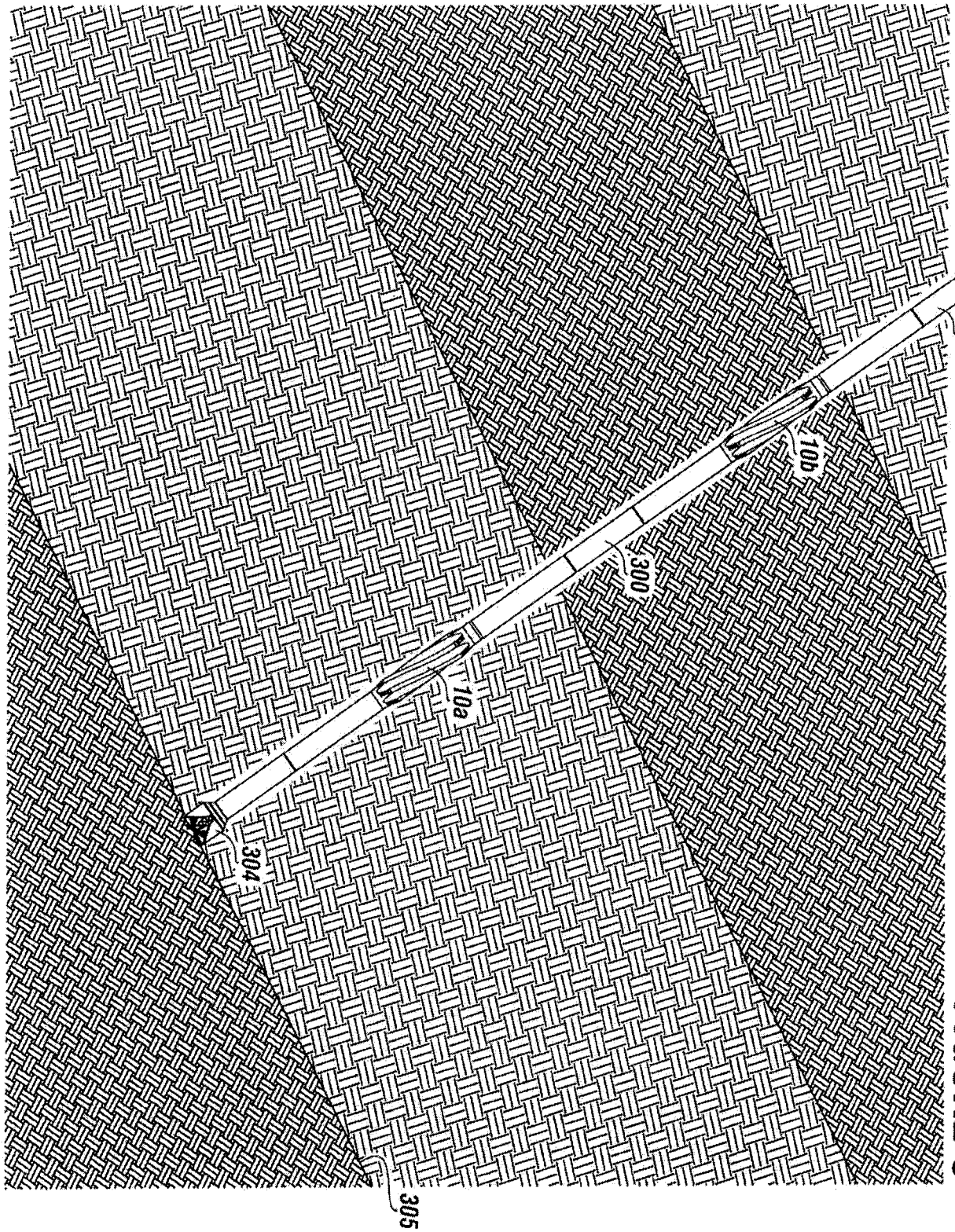
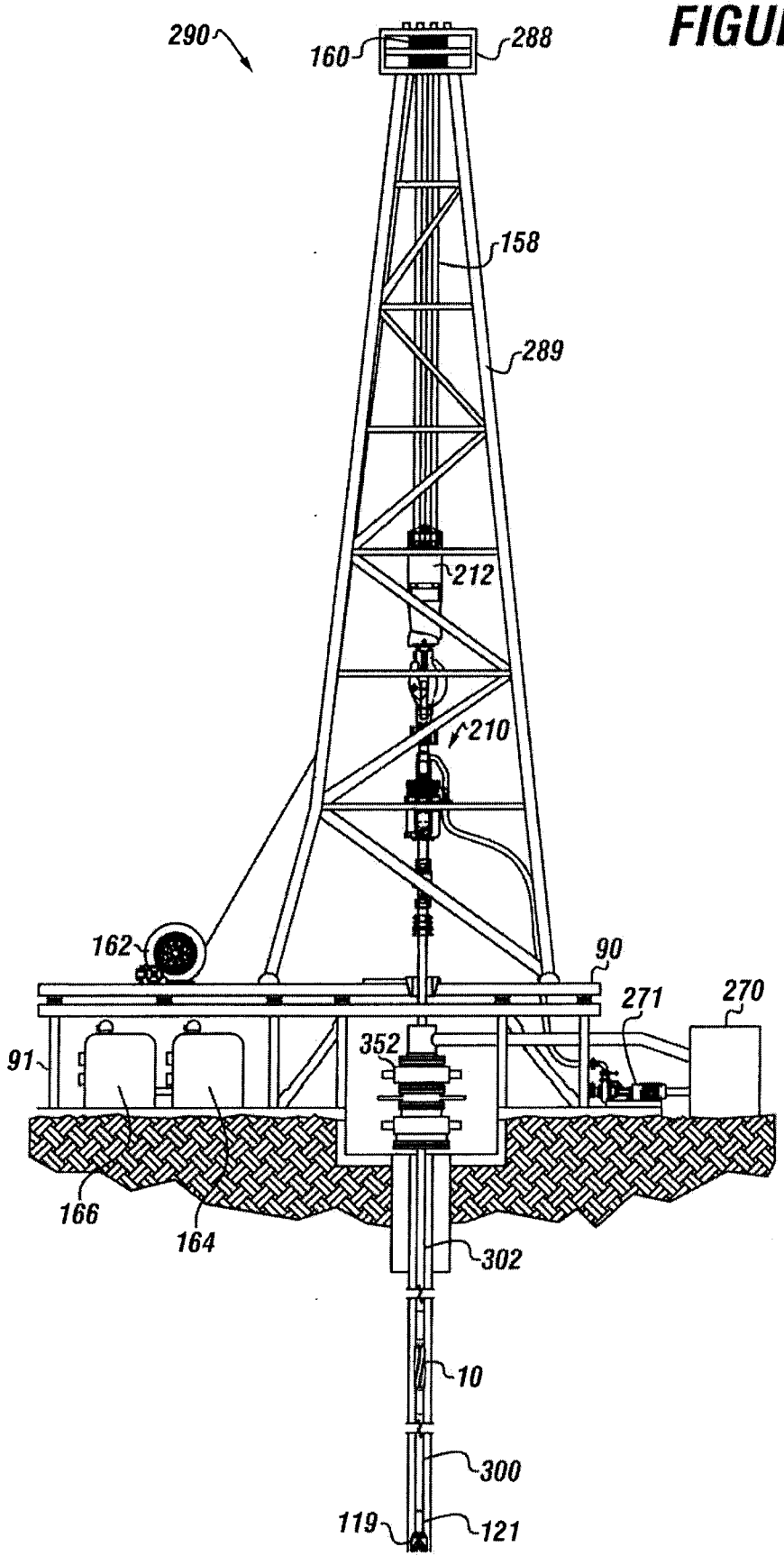


FIGURE 6

FIGURE 7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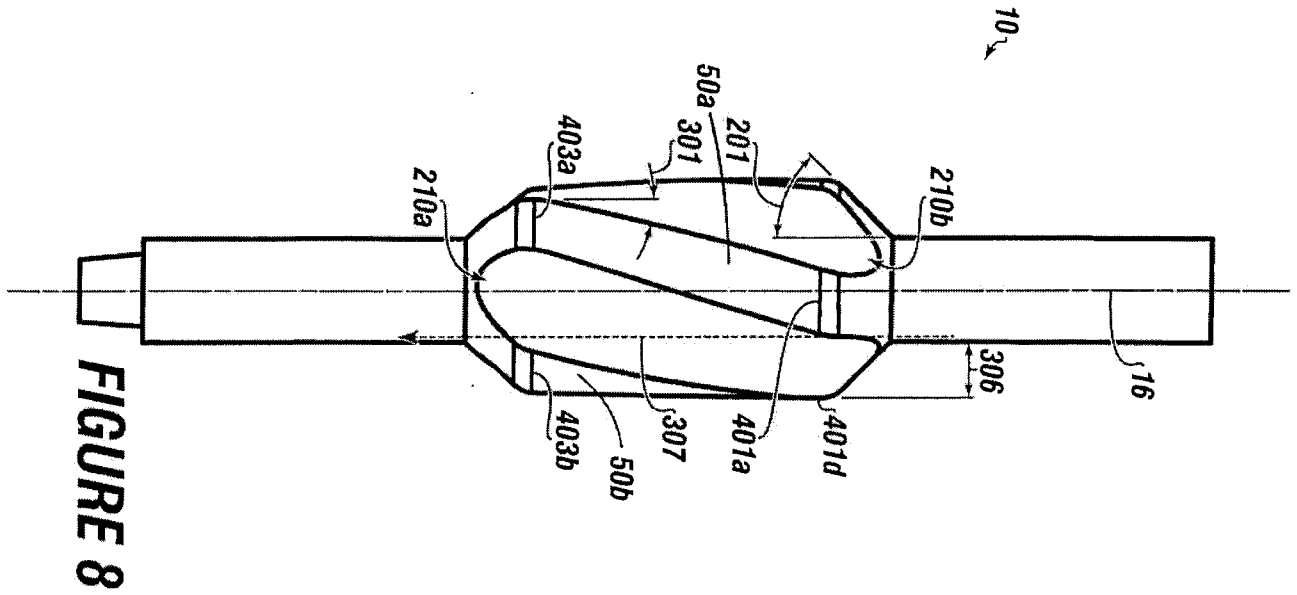


FIGURE 8

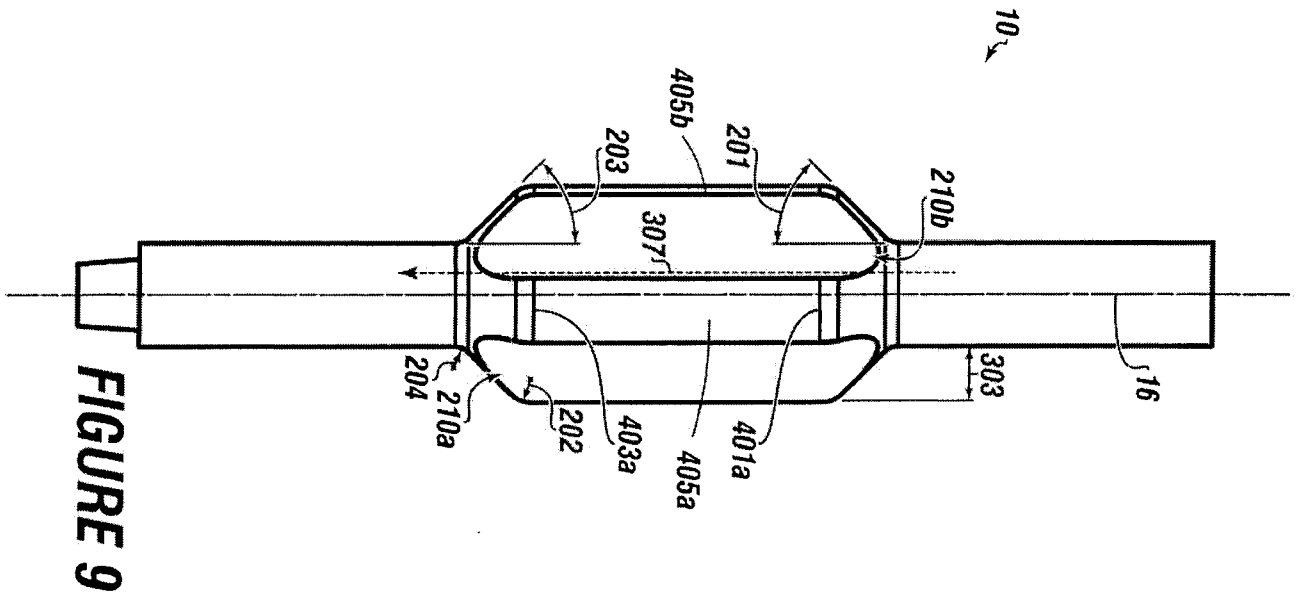
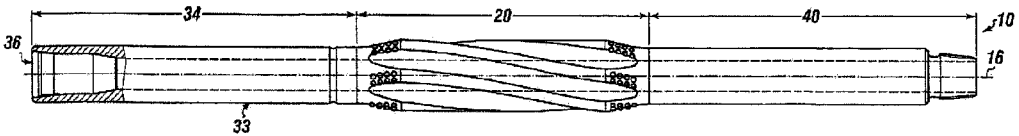


FIGURE 9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